BASUTOLAND

DEPARTMENT OF AGRICULTURE

ANNUAL REPORT

1955

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OF

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PART I

THE AGRICULTURAL INDUSTRY OF BASUTOLAND AND ACTIVITIES OF THE DEPARTMENT OF AGRICULTURE

SECTION I

REVIEW

1. A BRIEF DESCRIPTION OF THE TERRITORY AND ITS CLIMATE

Basutoland is an enclave within the Union of South Africa, some 11,700 square miles in extent. Temperatures range from occasional periods when maxima rise above 90° F., to over 20° F. of frost in winter. Rainfall is variable, but averages about 29 inches yearly, mostly falling during the summer months. Growing seasons for the main crops are short, limited by the arrival of planting rains in the spring and the advent of the first frosts in April. The agricultural wealth of the Territory lies in exports of wool and mohair, and to a relatively minor degree wheat, sorghums and peas in that order.

The Territory is sharply divided into two, four fifths of it being steeply mountainous and practically without roads, reliance being placed almost entirely upon pack animals by the 200,000 inhabitants of these parts for transporting their produce and requirements. Compared with lowland areas, where soils are largely derived from sandstone, mountain soils are rich, production there depending upon rainfall and human effort. The larger proportion of the population lives however in the lowlands and foothills to the west of the Territory, where living conditions are not quite so difficult; but crop yields are poor on account of soils which are fundamentally lacking in plant nutrients, having been subjected to many decades of exploitation. Monoculture, lack of return of animal and crop wastes to the soil, farming operations almost invariably late (which cannot be risked with a growing season which is usually so short), and soil erosion form the background to the crop production picture in the lowlands.

2. POLICY

All aspects of policy are directed towards reversing the downward trend in production which has been in progress since the days when shifting cultivation became no longer possible. It is considered that the reversal process must essentially start with a background of education in agricultural matters, combined with demonstration that a very much better living can be obtained from the average holding of 6 acres of arable land, which is all that is available for a family in the Territory. In the body of this report information is given on the working of the Pilot Project, Mechanized Group Farming and Field Trials with the commencement of the application of their results, the first year's work at the Agricultural School, and the first attempt at short agricultural courses for chiefs and headmen, together with the style of extension work which the field staff of 111 demonstrators are expected to undertake. Very many of the Basuto people who have to rely solely on their land for their existence are anxious to improve their farming methods. Equally there are many who are content to allow the downward trend to continue. Much of the extension work depends upon the effort which the field staff of demonstrators is able and willing to expend ; as time goes on it is expected that a considerably higher standard of field work will result from the increasing number of men who will have passed through the Agricultural School becoming available for posting to field duty.

Other main aspects of policy which are dealt with in the report include :

Soil conservation, including control and rational usage of grazing areas ;

Improvement of wool and mohair, the main sources of Territorial income ;

The distribution of phosphatic fertilizer ;

Improvement of horses (for transport) and bovines, both by active breeding methods and restriction of importations to types which are likely to improve local stock ;

Improvement of crop seed ;

With assistance from the Registrar of Cooperative Societies, fostering the cooperative movement for the sale of produce.

3. STAFF

The senior staff, excluding officers on secondment, at present consists of a Director, Principal Agricultural Officer, Principal Veterinary Officer, Veterinary Officer, Agricultural Officer, Soil Conservation Officer, Wool and Mohair Officer, Soil Fertility Officer, two Senior Agricultural and Livestock Officers and eight Agricultural and Livestock Officers and Assistant Agricultural and Livestock Officers, who are assisted by a field staff of soil conservation foremen, veterinary assistants and demonstrators. Disposition of staff is given in Appendix II.

In June Mr. D. D. Campbell, M.C., was appointed as Principal Agricultural Officer on transfer from Uganda.

Mr. S. Youthed, who has served in Basutoland for 4 years as Development Officer on contract, has been appointed Agricultural Officer, and will succeed Mr. Collett on the latter's retirement early in 1956.

Mr. J. Kotsokoane, also a Development Officer, returned from a year's post-graduate agricultural training at Wye, and has been appointed Agricultural Education Officer in charge of the Agricultural School.

Mr. R. F. Phillips was transferred to the Department as office organizer in place of Mr. N. Drew.

Mr. F. Makhooane has been appointed as Clerk-Storeman in place of Mr. Schefermann, who has retired from the service.

Messrs. D. Lekena and S. Letsie, Development Officers, and Messrs. Ntšasa and A. Mathule, Assistant Agricultural and Livestock Officers, have been acting as Agricultural and Livestock Officers during the year, as also have Development Officers Axentowicz and Seape.

Mr. W. Fitzsimmons accepted transfer to Swaziland as Veterinary Officer, Bremersdorp.

Messrs. K. Popiel and R. Story left the service on leave pending completion of contracts.

It is with regret that the death of Mr. M. R. H. Barry, who only retired on pension recently from the Service, has to be recorded.

The work of Mr. Duty Lekena was recognized by his award of the British Empire Medal at the end of the year.

4. WEATHER CONDITIONS

In Appendix I (Page 60) are given average monthly rainfall figures for the period September 1954 to December 1955, together with a 5-year monthly average for comparison. Spring rains were late in arrival, and as is usually the case after a long and severe winter, oxen were in poor condition for ploughing. Consequently planting of food crops was late. Conditions for growth during January and February were poor, on account of very heavy and continuous rains, with resulting temperatures being too low for healthy growth of maize and sorghums, the main food crops. Had the first frosts been later, yields would have been fair, but growth was brought to an abrupt finish by frost on 7th April. Over large parts of the lowlands crops were almost a complete failure. It is fortunate that adequate supplies of foodstuffs have been available for importation.

5. VISITORS AND VISITS

Work in Basutoland continues to arouse the interest of many people from outside the Territory. Great assistance has been given to progress in implementing departmental policy by visits by various technical authorities, whose help is gratefully acknowledged.

During the year the following visitors came to Basutoland and were shown agricultural development in progress :–

Mr. Pollock, of Fort Hare University College ; Dr. van Praagh from Christ's Hospital ; Messrs. H. Hutchinson and I. S. Hutcheson from Swaziland and the Bechuanaland Protectorate ; Mr. W. K. H. Campbell ; Professor Batson from the University of Cape Town ; Sir Christopher Cox ; Dr. Ross, Secretary General of S.A.R.C.C.U.S. ; Mr. T. S. Sydenham Clarke ; Messrs. R. K. Kerkham and I. Dale from Uganda ; Mr. R.

M. Green from British Somaliland ; Dr. Kreuz from the Union of South Africa ; His Excellency Sir Percivale and Lady Liesching ; Mr. Astley Hawkins from Reuters ; Dr. H. Greene from Rothamsted ; Mr. G. A. Haswell ; Mr. W. Boa ; Mr. Surridge ; Professor D. D. Crary from Michigan University ; Professor R. Lindsay Robb of Food and Agriculture Organization, Costa Rica ; Delegates to the meeting of the Southern African Regional Committee for the Conservation and Utilization of the Soil from Angola, Mozambique, Nyasaland, Southern and Northern Rhodesia, South West Africa, Swaziland and the Union of South Africa ; Sir Saville Garner ; and Colonel van Heerden from Swaziland.

Visits to meetings outside the Territory by members of the Staff included :

To Swaziland in an advisory capacity - Mr. A. C. Venn ;

To a meeting at Pretoria of the Locust Control Organization - Mr. D. D. Campbell ;

To the meeting at Entebbe, organized by C.C.T.A. on Farm Mechanization - Mr. A. Mapham ;

To Somaliland and Uganda as an adviser on soil conservation work - Mr. L. H. Collett ;

To meetings of the South African Wool Board and the Mohair Advisory Board - Mr. G. R. Chalmers ;

To meetings of the Union Maize and Wheat Industry Control Boards - The Director.

6. ACKNOWLEDGMENTS

It is a pleasure to record here my appreciation of the assistance which I have had from the Paramount Chief and Advisers, from the newly formed Committee for the control of prices of primary produce, and from the Traders' Advisory Committee. To the staff of the Department I offer my thanks for another year of loyal, selfless service.

P. A. BOWMAKER,
Director of Livestock and Agricultural Services.

AGRICULTURE

CROP PRODUCTION, FOOD SUPPLIES AND EDUCATION

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1. EXPORTS AND IMPORTS OF FOODSTUFFS

Except in isolated parts of the foothills where spring rains were earlier than elsewhere crop yields generally were much below average. No effort is made to obtain statistically accurate figures of yields, but the indications given from sample area observations show that a larger proportion of the arable ground than usual remained unploughed because of the late arrival of rains.

In the table below are given exports of the principal crops, which when compared with those for the previous years, and taking into account also importations of maize (see Appendix III), give an indication of the adverse season experienced.

EXPORTS OF FOODSTUFFS
(In bags of 200 lb.)

	1952	*1953*	*1954*	*1955*
Wheat	36,589	38,629	54,478	27,575
Peas and Beans. . . .	18,200	25,967	54,160	39,677
Sorghums and Malt . .	89,983	57,951	17,371	10,168

Wheat exports were lower than imports of wheaten products by 19,353 bags; 22,000 bags of sorghums were imported; and 219,380 bags of maize on which the Union Government consumers subsidy at the rate of 5/6½ per bag amounting to £60,655 was refunded, were imported from the Union of South Africa.

2. MAIZE AND SORGHUMS

Maize and sorghums are the principal crops of the lowlands and the lower parts of the mountain valleys, maize prepared in various forms being the staple diet of the people. Both are normally sown in October or November and ripen in May. The shortage of rain during the autumn and winter of 1954 left inadequate winter keep and consequently working oxen were in very poor condition for spring ploughing; planting rains were late, oxen in any case are not sufficient in numbers for timeous ploughing; the nett result being that only a portion of the area normally planted to these crops was sown, and much of that very late. Growth was stopped by a general frost when grain was in the dough stage.

The general failure of food crops has had its usual reaction on the territorial economy. Money which would normally be spent on other things has gone to provide necessities, with a consequent depression in trade.

Standing crops, to be harvested May to July 1956 are in very fair condition, due quite largely to the excellent rains in December. Much stalk borer damage is however in evidence, particularly in the earlier planted fields. The demand for a proprietary brand of D.D.T. suspension for its control continues to increase.

3. WHEAT

(1) *Winter Wheat*

In the lowlands (i.e. up to an elevation of about 6,000 feet) wheat is sown in May or June for harvesting in the following December and January. The crop is not of very great significance in overall crop production in the Territory. Because of the low rainfall in the autumn and winter of 1954, crops harvested in January were poor. When it became apparent that maize yields were going to be very low, arrangements were made for wheat seed of a variety known to do well in bordering areas of the Orange Free State to be made available for distribution in all lowland districts. Over 600 bags of seed were sold. Land was in excellent condition for planting, with adequate subsoil moisture for winter growth, and some excellent yields are in prospect in many parts. Bulk purchase of seed was financed by the Basuto National Treasury.

It is of interest to record that a much greater area of winter wheat was sown in the northern lowlands than has previously been noted, a move which is satisfactory both from the dietetic and soil conservation viewpoints and one which will be fostered.

(2) *Summer Wheat*

Summer wheat as a crop is unique in Southern Africa, its growth being confined to the mountain valleys of Basutoland up to an elevation of 8,500 feet. Economically it is of much greater importance to Basutoland than the lowland (winter) crop.

The 1955 harvest was patchy but on the whole fairly satisfactory from the viewpoint of food supply. A smaller quantity than usual was available for export. The standing crop is excellent, except in parts of the upper Orange Valley, and it may be anticipated that exports during 1956 will be larger than usual.

All wheat leaving Basutoland is consigned to agents of the Union Wheat Industry Control Board, with which body close liaison is maintained.

4. OTHER CROPS

Peas, beans, oats and barley are grown in small areas, mainly in the mountains. Basuto peas, well known in the Union trade, easily head the list in economic importance, contributing quite largely to the split pea

industry in Natal. Peas are grown as a summer crop, harvested from March onwards. The 1955 crop was fair, being partly damaged by rain in the autumn. Prices for peas remained in the neighbourhood of £3. 10*s.* per bag of 200 lb.

5. TREE PLANTING

The need for establishment of tree plantations, purely as a source of supply of fuel, remains. From efforts which have been made in the past it is quite evident that satisfactory growth of trees in the early stages cannot be maintained unless plantations are securely fenced against the depredations of livestock. As relatively heavy capital expenditure is involved in this, financial assistance for the purpose is being sought from the Colonial Development and Welfare Fund. In the meantime the supply of planting material has to be considerably increased, and to this end an officer of the Department is being sent to the Colonial Development Corporation plantations in Swaziland for a short course in nursery technique.

Several large areas of suitable hillside have been fenced and planted during the year with the assistance of funds provided by the Basuto National Treasury. Applications from individuals for the allocation of land to them specifically for tree planting have been disappointingly few.

The usual number of timber and fruit (mainly peach) trees were distributed, and some effort has been made to interest pupils in primary schools in tree planting.

As a direct measure for controlling storm run-off, considerable activity in tree planting is in progress, this being reported upon more fully by the Soil Conservation Officer.

6. MANURING

The use of kraal manure in cultivated land remains very much the exception rather than the rule. It will not be until other sources of fuel become available, and there is a better understanding of its value among the people, that its use will become more general. Reference is made later to the sale of two-wheeled carts, and it is hoped that these will remove one of the present obstacles to carrying manure on to the land.

A brief reference is also made in a later paragraph to the sale by Government of superphosphate mixture. Approximately 100 tons which were purchased found a ready market in most districts, and it is expected that as a result of this year's crop increases the demand next season will be heavy.

One of the difficulties which has been encountered lies in persuading people to apply a sufficiently heavy dressing of phosphate. It has been determined experimentally that about 150 lb. per acre is probably the optimum dressing. Phosphate has been supplied by the trade in 125 lb. pockets, and a real danger to the policy of steadily increasing its use lies in the fact that farmers purchase one pocket and expect it to

be sufficient for one field - (average size 2½ acres). In an endeavour to overcome this, continued propaganda is being spread by the field staff.

7. VEGETABLE GARDENING

The encouragement of vegetable gardening as part of the effort which is being made to improve the diet of the Basuto has continued to be a general subject for field propaganda. Vegetable seed is purchased in bulk and broken down into packets of a size to suit the needs of individual gardeners. A new departure this year was the replacement of the usual free issue by payment for seed. 45,000 packets of seed were made up, and sold very readily indeed at a penny a packet, a slightly sub-economic figure.

8. CO-OPERATIVE SOCIETIES

At the end of 1955 there were 47 registered co-operative societies, comprising 14 wool and mohair marketing societies, 10 consumers' societies, 9 agricultural societies, 12 mechanized farming societies and 2 salary earners' savings societies. During the year, 3 wool and mohair marketing societies, 1 consumers' society, 2 savings societies, 6 mechanized farming societies and 2 agricultural societies were registered. 2 wool and mohair marketing societies and 2 consumers' societies were liquidated. 1 mechanized farming society has ceased to operate, and is to be liquidated.

The marketing of wool, mohair, hides and skins remains the chief co-operative activity. In the year ending September 30th, 1955, co-operative societies exported 415,520 lb. wool and 26,327 lb. mohair. These figures represent increases of 11 per cent and 13 per cent respectively on exports for the previous year. The volume of hides and skins exported was unchanged. The decline in wool prices continues. There was a sharp rise in mohair prices during the last quarter of 1955. The average price for hides and skins over the 1954-55 season was 36 per cent less than that for the previous season. Marketing costs, in the form of handling and transport charges, have continued to rise. Although the total volume of produce marketed by co-operatives has increased, turnover figures have been reduced by the drop in prices received for wool, hides and skins.

Both marketing and agricultural societies supply their members with agricultural requirements. The agricultural societies also supply consumer goods. Upon the failure of the Basutoland maize harvest in 1955, the wool marketing societies imported considerable quantities of maize from the Union of South Africa, for sale to their members.

The co-operative mechanized farming societies are discussed elsewhere in this Report.

There is little possibility of any large scale expansion of co-operative marketing, unless societies can obtain capital to finance the handling and storage of produce. At the present time, falling commodity prices, rising costs, and active commercial competition leave little opportunity for capital accumulation. The question of financial assistance for co-operatives is now under consideration.

Winnowing grain. Traditional method

Poultry sales

Oxen cultivating in maize

A typical Buffer Strip after 5 years, Bafali valley Mokhotlong.

9. GRAZING CONTROL

All grazing in Basutoland is considered to be communal. Small areas have been customarily set aside for thatching grass or very occasionally for winter grazing, but until a few years ago (see previous Annual Reports) no effort of any kind was made to rest grazing and so allow recovery of grass cover.

The problem falls into two quite distinct sub-divisions – mountain grazeing, known as cattle post, above 8,000 feet and normally used for bovines only in the summer months, and grazing in the vicinity of permanent habitations. The former is at the disposal of the Paramount Chief, who largely delegates this function to the Ward Chiefs, while the latter is in the care of local chiefs and headmen. Greater attention has been given so far to the cattle post areas, where ten years ago large expanses of mountainside were grazed bare, and would have been subject to extensive soil erosion had no action been taken then. Work so far has consisted of resting these areas ; restocking, which could have been safely undertaken some years ago has been deferred pending approval of the Paramount Chief and Basuto people of regulations which would rationalize the usage of the cattle post area as a whole. Approval of draft regulations was given by the Basutoland Council in 1954, and in November 1955 the Paramount Chief issued the order which is reproduced as Appendix IV to this report.

The work involved in assessing livestock numbers to be carried in each mountain catchment is going to be heavy ; it could not be undertaken without the use of the 1 : 50,000 map prepared by the Directorate of Colonial Surveys, of which the preliminary sheets are now complete.

That the Basutoland Council, representing the people, were able to accept the draft order is considered to indicate that those in positions of responsibility fully realize the need for grazing control. This is borne out by the increasing number of sub-chiefs and headmen who are seeking advice as to the adoption of grazing control systems to their own (village) areas. In many parts of the lowlands it is now realized that there is no room for small stock if grazing areas to maintain milk cows and working oxen in numbers sufficient for the needs of the people are to serve these purposes adequately. The process of educating the people in the value of grass and through it getting a general wish to see better grass cover is perhaps slower in producing results than a strict set of regulations (which in any case would be most difficult to enforce) imposed upon grassland users. But it is considered that the system which is at last gradually taking shape is going to result in permanence which it would be difficult to ensure by any other means.

10. MASERU EXPERIMENT STATION AND SCHOOL OF AGRICULTURE

Work was started on the establishment of a central experiment station at Maseru and eleven small sub-stations in the districts early in 1953, the project being financed largely from Colonial Development and Welfare Funds. Capital development proceeds.

In 1954 a further allocation (C.D. and W. Scheme 2197) was made available for the capital cost and initial recurrent expenses of a small agricultural college. Sited on the Experiment Station, the buildings having been completed in February, the school was opened in March, 1955.

The functions of the station are threefold :

1. Research into soil and crop problems.
2. Agricultural and conservation education.
3. Production and/or distribution of various agricultural products.

(1) *Research*

In Part II Section III of this report are given the detailed results of the 1954-55 season experiments. Below is a summary of findings.

The N.P.K. Series: For the third successive year the set of 32 experiments with N, P and K on maize, wheat and sorghum, laid out on the sub-stations, showed up large responses to phosphate on most soil types in the lowlands and foothills. For example, the mean increase (9 stations) in maize grain brought about by an application of 200 lb. of phosphate fertilizer per acre was 5·22 bags per acre. At one centre yields were increased from 7·8 to 18 bags per acre.

The response to 200 lb. of fertilizer per acre was only slightly better than that to 100 lb. per acre, and the response to phosphate was for no crop affected by the presence or absence of applied nitrogen and potash. At only one centre did nitrogen (200 lb. sulphate of ammonia per acre) increase yields, while potash generally had a slight depressing effect.

It is concluded that phosphate deficiency is the most important single limiting factor to increased production in Basutoland.

Experiments including lime treatments: Four experiments included lime applications. Results at this stage can give only a pointer to the effects of lime, a true picture of which will only be obtained after many more years' work. Three tons of agricultural lime per acre increased maize yields on two soils by more than three bags per acre, while no increases were brought about by liming on two other soil types.

Manure: Kraal manure is seen to have large direct beneficial effects and substantial first year residual effects on maize and wheat in the lowlands and foothills. Neither manure nor fertilizers increased yields in the fertile "Mountain Black Clays".

Types of phosphate fertilizer: Rock phosphates, after the second successive year of application, are likely to prove more effective than superphosphate on the more acid sandy loams of the lowlands.

Cooperative Experiments: 16 experiments testing various rates of phosphate fertilizer on maize, laid out in co-operation with landowners on typical Basuto fields, showed up large responses to phosphate.

Nitrogen: Nitrogen response in maize is related to plant stand density, and possibly to soil type. It is only on red sandy loams (doleritic) that nitrogen responses have been measured.

Minor Elements: No responses have been obtained to applications of minor elements.

Weedkillers: Selective weedkillers, although effective, are not likely to play an important role in Basutoland.

Crop Studies: Variety trials, and testing and selection work on maize, sorghum, wheat, beans, castor, linseed, cowpeas, soybeans, sunflowers and groundnuts were continued, and further data on performances accumulated. The superiority of the South African maize hybrids was well demonstrated in a trial of 25 varieties, as was that of the Spitzkop wheat varieties recently bred in the Union for production on the Highveld.

(2) *Education*

(i) *Agricultural School:* The capital works for the Agricultural School were completed early in 1955. These consist of ten dormitory rondavels, two lecture rooms, a students' mess and administrative block, an ablution block, two staff houses and an electricity generating hut.

Details of the background to the establishment of the school and of its functions were given in the report for 1954.

With a capacity of 40 resident students, the school trains young Basuto men in general agriculture in a two-year diploma course.

Pending the appointment of a qualified Agricultural Education Officer, an Agricultural and Livestock Officer (Mr. H. B. Wroughton) was seconded to act as Principal, and training of the first intake of 20 selected students commenced in March.

The teaching programme drawn up has been based on the agricultural requirements of the territory; thus the major subjects are Soil Conservation, Field Husbandry, Wool and Mohair and Animal Husbandry, the teaching of which is the responsibility of the respective specialist officers of the Department.

While full courses of lectures are given in all subjects special emphasis is placed on practical training. A school bus is available for conveying students into the field, where they work on dam building, tree planting, wool classing, etc. On the station, students work not only on the various sections – forest nursery, pigs and poultry, field experiments, etc. – but themselves run a set of small agricultural units, on a competitive basis. The units are based on differing farming systems, all of which are applicable to Basutoland, and they serve not only as a training ground in practical agriculture for the students but also have an important fact finding function.

After initial difficulties, inevitably associated with the start of a new project, a routine was established and training has continued satisfactorily. After a period of further study in the United Kingdom, Mr. J. R. L. Kotsokoane was appointed Agricultural Education Officer and assumed duty at the School in December.

(ii) *Vacation Courses:* An important subsidiary activity at the school is the holding of short training or refresher courses for departmental staff, chiefs and headmen, and school teachers during the school vacations. Thus, during the year three short courses were organized:

A refresher course for 30 field Demonstrators;
A course for 400 Maseru district chiefs and headmen;
A course on field experiment methods for 16 selected Demonstrators.

As part of a programme of "conservation education", sponsored by the Southern African Regional Committee for the Conservation and Utiliza-

tion of the Soil, a course on conservation and methods of teaching agriculture will be held shortly for 35 secondary school teachers.

(iii) *Agricultural Journal:* In order to disseminate the data obtained from various agricultural experiments, an agricultural journal entitled *The Basutoland Farmers' Journal* was inaugurated in 1955. This is published twice yearly in spring and autumn. In addition to propaganda a series of instructive articles written by officers of the Agricultural Department and dealing with agricultural activities as applied to local conditions is published. The publication is subsidised to some 50 per cent of the cost and is sold to the public at 1/ per copy. It is proving popular and about five thousand copies of the first issue were sold.

(3) *The Farm*

(i) *Development Work:* Progress on capital development continued satisfactorily. The following works were completed: 5 miles of internal fencing, one labourers' mess and ablution room, one brooder house, one pump house, two stores, two rondavels, five pig styes, four poultry houses, twelve poultry arks and the various school buildings. Under construction are two large farm sheds and further pig styes and rondavels. Fencing continues.

(ii) *Pigs and Poultry:* The scheme for the production and distribution of pigs and poultry has in its first season of operation proved highly successful. 6,100 Rhode Island Red chicks were hatched and 85 Large Black piglets thrown.

Each week some 200 three-month old birds are transported to one of the nine district holding pens and there sold at production cost price to Basuto buyers. 10 weaner pigs per month are similarly disposed of. In all districts the demand for stock has far exceeded the available supply.

(iii) *Irrigation Scheme:* Information on the comparative merits in the lowlands of flood and spray irrigation of lucerne is being accumulated on a 25 acre project on the banks of the Caledon river. Indications to date are that, given terrain that does not require a great deal of preparatory earth moving, flood irrigation is more satisfactory than spray irrigation.

(iv) *Forest Nursery:* In its first year after transfer to the station, the nursery produced 20,000 boxed evergreen tree seedlings and 10,000 young deciduous trees from cuttings. Production will be considerably increased in 1956 to meet the demands of the new departmental tree planting scheme.

(v) *Agriculture and Horticulture:* Good progress has been made in the development of stable arable and grazing rotation systems. The vegetable requirements of the school are now being met from the station garden.

SECTION III

LIVESTOCK INDUSTRY

1. ECONOMIC ASPECT

The year 1955 was a bad one. It commenced with the whole country in the grip of a very severe drought, which was broken towards the end of January by heavy rains, which continued through until the end of March. The resultant conditions were ideal for the breeding of insects and parasites and the country suffered accordingly. Due to the late rains and early frosts the maize harvest failed, and there was very little corn stover available for the stock during winter. The stock came through the winter fairly well, as there was a plentitude of grass, even though this was of low nutritive value, but the late frosts and delayed rains have retarded their recovery and at present the condition of stock remains poor.

2. LIVESTOCK AUCTION SALES

Auction sales were held only in Qacha's Nek where 1095 head of cattle and 1744 sheep were sold at prices which compared very favourably with those in East Griqualand. It had been intended that one-channel marketing be introduced early in 1955, but owing to the unfavourable weather conditions, and the resultant poor condition of the stock, it was considered inadvisable to proceed with the scheme. As the success of such a system of marketing depends on the full co-operation of the livestock owners and traders alike, it was probable that an early setback would considerably prejudice them against such a scheme. The project is being kept in view and will be proceeded with as soon as circumstances permit. Again this year exports exceeded imports, the number of cattle exported being considerably higher than for some time. This can be ascribed to the failure of crops throughout Basutoland, and the consequent necessity for the Basoto to sell their livestock to enable them to purchase maize.

3. SHEEP AND WOOL

(1) *General*

Unlike the previous year, when the Basutoland wool clip showed unmistakeable signs of drought, the quality of the 1955 clip was satisfactory. This is ascribed to the phenomenal rains experienced at the beginning of the year.

Through perseverance, and with the assistance of the Agricultural Department the Basutoland wool producer has developed into an important asset in the economy of the Territory. There has been a tendency however during the past two years for flock owners to use undesirable types of ram. As a result there has been a certain deterioration in the quality of

the wool clip. In March this fact was brought to the notice of the Paramount Chief, who issued instructions to all principal chiefs to have such rams emasculated. The drive by the chiefs and the Department towards the complete elimination of all undesirable rams continues.

(2) *Preparation of the Clip*

The get-up of the clip improved considerably in the year, although there is still room for improvement, especially as regards uniformity in length and quality in each class.

In the past buyers and manufacturers have made complaints about the use of unscourable marking fluids in Basutoland wools, also of the presence of foreign matter (e.g. jute). In connection with the former it is for report that the use of marking fluids is diminishing considerably. Two complaints of foreign matter found in Basutoland wools were received from overseas, this being at a time however when the complaint was general in regard to much of the wool exported from Union ports.

(3) *Stock Theft*

Theft of wool from grazing animals continues. This malpractice is having a retarding effect on all wool and mohair improvement schemes, and at the same time discouraging flock owners from improving their sheep and wool.

(4) *Wool Classers*

Training of Government and Traders' wool classers has been satisfactory ; there are now sufficient trained classers available to handle all the wool produced in the Territory. Refresher courses will be continued in the future in order to maintain a uniform standard of classing throughout Basutoland.

(5) *Wool Shed Construction*

The mule transport team, comprising 41 mules and 14 horses, has worked well. Materials for 14 sheds were transported and erected in almost inaccessible sites in the mountains during the year. The heavy rains during the autumn delayed operations considerably, however. It is hoped to complete this important programme in the next four years.

(6) *Introduction of Merino Rams*

In pursuance of the policy of wool improvement, 795 Merino rams were imported from the Union of South Africa during the year, bringing the total since the inception of the scheme in 1936 to 14,095 rams. As a result of these annual importations the quality of wool produced in the Territory has improved beyond recognition. This improvement must continue, as the wool industry in Basutoland is at present the main source of Territorial income.

(7) *Sales and Returns*

Despite the lower price levels established at the beginning of the new season in September, serious fluctuations have been conspicuously absent

since the opening of the sales and the general picture reflects a healthy demand, and is such as to encourage the belief that wool prices will maintain stability from now on. During the year 7,700,701 lb. of wool were exported to the value of £969,005 at the coast, the overall average price of all types exported being 30·2*d.* per lb.

4. ANGORA GOATS AND MOHAIR

(1) *General*

In view of the high reputation Basutoland mohair has earned in overseas markets, it is becoming increasingly essential for producers to improve the quality of their clip and the standard of their flocks in order to maintain that reputation. To assist flock owners in this the Department has for disposal to breeders well bred Angora rams imported from the Union of South Africa.

The mohair industry of the Territory is making slow progress. Complaints from overseas about the deterioration of the mohair clip were put before the Paramount Chief, who decreed that undesirable goat rams in the Territory should be emasculated. With the co-operation of the chiefs, the Department is making good progress towards the elimination of these rams. Not until such time as all undesirable goat rams are castrated and the goat reduction scheme (see previous Annual Reports) in full operation may any appreciable improvement in mohair quality be expected.

(2) *Preparation of the Clip*

The classing and packing legislation introduced in 1953 has met with universal approval by buyers and users from Bradford and the Continent, and the general get-up of the clip made steady progress ; so much so, that requests from the Continent for further information in connection with grades, and the quality and quantity exported, have been received. Considerable time was devoted to training Government and Traders' classers in mohair, and it is now considered that all traders are properly equipped to handle the product.

(3) *Angora Ram Importations*

During the year 273 angora rams were imported for resale to flock owners at a price below cost. It is unfortunate that breeders of angoras are not so interested in improvement of these animals as are breeders of merinos. Imported rams are being disposed of only with a certain amount of difficulty.

(4) *Sales and Returns*

The year has been a very satisfactory one for the mohair industry. Not only have prices been higher generally than the previous year, but the market remained firm throughout, with prices hardening as time went on.

The total quantity of mohair exported during the year was 1,103,000 lb. valued at £322,627 at the coast, with an overall average price of 70·2*d.* per lb.

5. HIDES AND SKINS

No progress can be reported, nor can any be expected unless pressure is brought to bear on the producers and exporters.

6. TATTOOING AND REGISTRATION

The tattooing and registration of large and small stock continues. The months of February and September are laid aside each year during which time the tank area supervisors are available to tattoo all livestock which have not been done before, or whose marks are no longer legible. Reports indicate that in some districts the campaign has been a marked success whereas others are very backward.

7. EQUINE IMPROVEMENT

The Agnes Mary Young Memorial Stud continues to make steady progress. Certain mares have been acquired by the stud either as purchases, or in the form of gifts, whereas others which have proved unsuitable have been disposed of. At present the stud consists of Silver Eagle, 2-year old stallion Ramon as teaser and 20 mares, with a further 5 mares on loan. During the 1954-55 breeding season 15 foals were born, and to date nine have been born this season. Unfortunately three of the best mares failed to conceive, but as all three were served during the early spring of 1954 this can be attributed to the intensely dry conditions which prevailed at that time. Present indications are that a further seven or eight foals can be expected this year. One mare died of horsesickness during the year, although inoculated, and two other mares lost condition to such an extent that it was considered inadvisable to mate them.

The first progeny are now fourteen months old and it is possible to form some opinion as to fitness for use in Basutoland. First impressions are favourable, and most animals are well set up and compact, with powerful hindquarters, short backs and good bone. They should prove very suitable as the sires and dams of the new Basuto pony.

Owing to the continued growth of the Central Stud, grazing is becoming an urgent necessity and investigations are being undertaken into the possible use of bull and mare camps for this purpose. At present the stud is housed at the veterinary clinic and shares the very inadequate grazing on the Experimental Farm, in rotation with the cattle used at that institution.

8. CATTLE IMPROVEMENT

Very little has been done on the Government side in this respect, but the stock owners themselves have been encouraged to undertake the improvement of their cattle by importing high grade bulls. Most stock owners favour the Brown Swiss breed and twenty-five Brown Swiss bulls are known to be standing at stud in the country. More and

more interest is being evinced by stock owners and it is considered that with these pioneers to show the way, cattle improvement will gradually gain impetus. Very little lasting improvement is possible unless the stock owners also improve their husbandry, but it has been observed that one or two of the Swiss owners are starting to feed their animals and gradual slow improvement should take place in that direction.

A minor improvement scheme has been launched in the Tebetebeng valley under the general supervision of the Agricultural Officer in charge of Pilot Project. Four closed herds, each consisting of 40-50 cows are being run with Government owned Brown Swiss bulls. The cows constituting these herds belong to the villagers controlled by four interested headmen, who have themselves undertaken to look after these herds and be responsible for the well being of the bulls. Each villager who has a cow in the herd pays his share, either in cash or kind, towards the maintenance cost of the bull. By this system it is hoped, in the course of the next five years, to build up four grade Swiss herds which will be kept under conditions similar to local indigenous and other cattle. The comparison of milk yield, death rate, condition, etc. will provide very useful information.

9. GOAT REDUCTION

In 1949 the Basutoland Council approved the reduction of the goat population in Basutoland and appointed a committee to enquire into the matter and make its recommendations. After long deliberation and considerable delay, caused by a difference of opinion as to the financing of such a scheme, the following plan has been approved and it is hoped to get the scheme into operation early in 1956.

Each and every owner of goats will give up 5 per cent of his goats each year for five years and while this will not bring about the 25 per cent reduction recommended by the committee it will serve to relieve overstocking to some extent and enable goat improvement to be expedited by permitting all non-mohair goats to be eliminated. The responsibility for the collection of these goats will devolve upon the Basuto Administration whereas this Department will be responsible for their marketing on a non-profit basis. A permit has been granted by the Union's Livestock Industry Control Board authorising Basutoland to despatch 600 goats weekly to the Durban Abattoir.

P. H. Brown, G. Chalmers,
Reporting Officers.

SECTION IV

VETERINARY

1. ANIMAL HEALTH

The year was marked by heavy stock losses from horse-sickness and bluetongue and towards the end of winter by considerable small stock losses due to worm infestation and malnutrition.

2. SMEAR EXAMINATIONS

A total of 74 smears was submitted for examination with the following results :

Anthrax	4
Quarter Evil	2
Anaplasmosis	2
Piroplasmosis (Bovine)	1
Piroplasmosis (Equine)	-
Piroplasmosis (Canine)	-
Negative	61
Unsuitable	4

3. SCHEDULED DISEASES

(1) *Anthrax*

Five outbreaks of anthrax were recorded during the year, one in each of the districts Mafeteng, Leribe and Mokhotlong and two in Maseru. In each case only a single animal was involved and further spread was prevented by expeditious inoculation of all in-contact cattle. 25,000 doses of anthrax vaccine were issued.

(2) *Quarter Evil*

42 outbreaks were reported during the year, the distribution being as follows :

Maseru	4
Mohale's Hoek	6
Quthing	16
Qacha's Nek	14
Mokhotlong	2

It appears therefore that this disease is most prevalent in the south and that the incidence in the northern districts is negligible.

Considerably increased quantities of quarter evil vaccine have been issued during the year, the total amounting to 15,100 doses as against 7,600 and 1,900 in 1953 and 1954 respectively.

(3) *Equine Mange*

A certain measure of improvement has been brought about in some districts by the efforts of the Tank Area Supervisors and Veterinary Assistants. Very little overall progress can be reported, nor has it been found possible as yet to embark on an overall campaign.

(4) *Mange in other Livestock*

With the exception of the odd case of bovine and canine mange no incidence of economic significance has been reported.

(5) *Lumpy Skin Disease*

This disease broke out in Maseru towards the end of the year and to date twelve cases have been diagnosed on the Maseru reserve. No reports have been received of outbreaks in other districts, but it must be expected that, in the absence of any effective means of control, lumpy skin will spread throughout Basutoland.

(6) *Other Scheduled Diseases*

Rabies, rinderpest, foot and mouth disease and East Coast fever do not at present occur in Basutoland.

4. NON-SCHEDULED DISEASES

(1) *Anaplasmosis and Piroplasmosis*

Several cases of gallsickness and redwater were encountered, mainly on the Maseru reserve and the neighbouring Experimental Station. One Swiss bull was lost from redwater, having failed to respond to treatment. Very limited amounts of gallsickness vaccine were issued, in all some 106 doses. Following the heavy rains of late summer and early autumn tick life was rife and though there was but little increase in the incidence of tick borne diseases, tick infestation was responsible for some loss of condition especially amongst cattle and horses. With the exception of a few owners who control ticks by hand dressing, no form of tick control is practised.

(2) *Strangles*

Several outbreaks of strangles have been reported from most districts of Basutoland. This disease is however easily recognized, and as treatment is readily effective no deaths were recorded.

(3) *Biliary*

There has been very heavy incidence of this disease both in dogs and horses. No losses of treated dogs have been reported and treatment of equine biliary with aureomycin has proved very effective and no losses have been recorded.

(4) *Verminosis*

The heavy and late rains in summer and the poor condition of the livestock brought about conditions ideal for severe worm infestation, and heavy losses from verminosis, especially in sheep, were recorded. It is disheartening to have to report that the importance of this disease is not yet apparent to the average stock owner, and that he normally fails to recognize the disease as such. Many reports of "a new disease never before seen in Basutoland" were received, which, upon investigation, was proved to be purely and simply due to heavy infestation of wire worm, bankrupt worm and nodular worm. In certain districts where the enthusiasm of the agricultural staff has overcome the apathy of the livestock owner, good progress has been and is being made with the small stock dosing campaign, but in view of the fact that contributions to the national income made by small stock is second only to that made by migrant labour an all out small stock dosing campaign is essential and long overdue.

(5) *Poisoning*

Seneciosis or "grass-staggers" accounted, as usual, for a number of deaths of horses, but on the whole the incidence seemed to be less than in previous years. Several deaths of sheep as a result of tulip poisoning were encountered but these losses were not of economic significance, nor were the few losses from prussic acid poisoning or "geilsiekte". Losses from mineral poisons were not recorded during the year.

(6) *Horsesickness*

Again this year Basutoland experienced a very severe outbreak of horsesickness which reached epizootic proportions in April. Fortunately (from the veterinary aspect) an early frost cut the outbreak short, but the brief outbreak was characterized by the peracute form of horsesickness and several horses, known to have been inoculated, contracted the disease and two died. For the first time mules contracted the disease and two old mules which were awaiting board died. As a result it has now been decided to inoculate all Government owned mules against horsesickness each year. The Basuto horse owners who have hitherto believed that horsesickness occurs every fifth year only have had their belief rudely shattered and as a result many have inoculated their horses this year. This year 2,000 doses of horsesickness vaccine have been issued, as compared with 1,600 doses in 1953 and 1954.

(7) *Bluetongue*

Losses of sheep from bluetongue were reported from the lowlands during the months of March, April and May. As the bulk of sheep were in the mountain areas at that time the losses were not of any economic significance. Altogether some 8,000 doses of bluetongue vaccine were issued.

(8) *Enterotoxaemia*

This disease has not as yet been encountered in Basutoland.

(9) *Rift Valley Fever*

Not diagnosed.

(10) *Distemper*

There has been a very marked decrease in the incidence of distemper. This can probably be attributed to the increased use made of distemper vaccine. 120 doses of vaccine were issued.

(11) *Feline Enteritis*

Very few cases of feline enteritis were seen. No vaccine was issued from this office.

(12) *Equine Enteritis*

Was not encountered during the year under review.

(13) *Infectious Infertility in Cattle*

The incidence of infertility in cattle is considerable, but malnutrition is regarded as the primary causative factor in this territory. It is considered likely that such diseases as Epivaginitis, Vibriosis, Trichomoniasis and Brucellosis may be contributory factors, but with the exception of contagious abortion no diagnosis has yet been made. Recent widespread outbreaks of Epivaginitis and Vibriosis in neighbouring areas of the Orange Free State have led to closer control over the importation of cows and bulls, but diagnosis of these diseases is by no means easy, and it is more than likely that cases may not be recognized as such by the lay inspectors responsible for import control.

(14) *Poultry Diseases*

(i) *Fowl Typhoid:* Heavy losses occurred in several camps, but more use is being made of the vaccine. During the year 13,300 doses of fowl typhoid vaccine were issued.

(ii) *Fowl Pox:* Few outbreaks were encountered. 13,000 doses of vaccine were issued.

(iii) *Coccidiosis:* Few cases were seen.

(iv) *Other Diseases:* Many cases of lymphoid leucosis and neurolymphomatosis were encountered.

5. GENERAL

The Clinic has been kept busy coping with the usual ills and in all some 2,400 cases were dealt with. Revenue earned amounted to £700. District veterinary assistants were also kept busy, but their efforts have been directed more against disease control than the treatment of the individual sick animal. Revenue earned by the districts amounted to £590.

With the departure of Mr. Fitzsimmons on leave in January 1955 and his transfer to Swaziland which immediately followed his return, there has been no veterinary officer in Basutoland during the year. Under the circumstances more responsibility fell to the veterinary assistants in charge

of the Clinic and the Central Stud, and I wish to express my appreciation of the sterling manner in which they carried out their increased duties. Mr. Motsamai has now been promoted to the post of Senior Veterinary Assistant.

P. H. Brown,
Reporting Officer.

SECTION V

SOIL CONSERVATION

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1. SUMMARY

The progress made during the last twelve months (1st January - 31st December, 1955) does not show marked acceleration on the achievements of the previous year. This may be attributed to the fact that in the three northern districts, work has been confined to three gangs occupied on heavy diversion furrow work in areas which had already been buffer stripped. These gangs have been operating in foothill country, which was not included in the original plan envisaged in the 1934 Pim Report. In the Maseru district, gangs have been operating in the badly eroded Thaba-Bosiu and Masite areas, while in the south operations have been confined to the Litšaneng and Tšakholo catchments. In actual fact, apart from dam work, only three gangs have been employed on new contour bank construction.

2. WEATHER CONDITIONS

Weather conditions have been unfavourable. During the first part of the year the Territory experienced very heavy rains lasting for two months. It is interesting to note that from the middle of January to the end of February 17·72 inches were recorded at Maseru. Later on the country went through a dry spell ; ground conditions were difficult, in that penetration was poor and consequently mechanical construction had to be heavily supplemented by hand labour, which is not only very slow but expensive.

3. PROGRESS

The progress made during the year in the principal sections of the work is summarised below :

Measure	*Prior to 1955*	*During the year*	*Totals to December 1955*
Area terraced Lowlands (acres)	409,528	21,020	430,548
Length of terraces (miles)	23,432	1,166	24,598
Buffer strips (acres) . . .	595,531	75,410	670,941
Diversion furrows (miles) . .	131,199	936	132,135
Dams constructed	447	35	482
Trees planted	970,817	41,735	1,012, 552
Dongas beaconed (miles) . .	4,898	447	5,345

(1) *Buffer Strips*

Buffer stripping in the mountain areas is virtually complete ; only in Maseru and Mafeteng districts are there small areas left to cover. The total acreage in the mountains covered with buffer strips this year is 75,410 acres at a cost of £4,596. This represents 1,501,000 yards of strips as compared with two million yards of stripping completed last year. This lower figure is attributed to the fact that except in the Maseru and Mafeteng districts, the work done might be described as "mopping up operations", i.e. being mainly concerned with odd lands in scattered mountain valleys. The working parties were often operating two or three days journey from their headquarters, and consequently did not get proper supervision. It is quite safe to say that all buffer stripping will be completed by next season.

(2) *Lowland Tractor Built Terraces*

Lowland terracing work must still carry on for about three more seasons. As the bulk of the area to be covered is in the south, where the general conditions of rainfall, grass cover and soil are poorer, the remedial effects of conservation works are perhaps slower. 21,020 acres have been protected, mostly in the Mafeteng district. The total cost of these 2,052,013 yards of terrace is £12,386. Cost of repairs to plant for the year was £3,937.

(3) *Diversion Furrows*

Only 13 miles of hand-made diversion furrows, protecting approximately 936 acres, have been constructed at a cost of £235. The reason for this low output is that it has been found after five years some of these works have not been properly maintained. Under the circumstances it was decided that hand made furrows should only be constructed where they are urgently needed and where their construction and maintenance can be properly supervised.

(4) *Dam Construction*

35 major dams have been made during the year at a total cost of £1,398. 10*s*. 0. Their total capacity is 31,953,000 gallons. In the south and in Maseru there has been very little activity in this section. Because dam construction gangs only moved into their areas last season the spillway works have not yet become consolidated. Actual dam construction work will begin this season. About thirty dam sites have been selected

and surveyed in the Maseru and Mafeteng areas. These sites include several which will necessitate the construction of spillways.

(5) *Tree Planting*

During recent years tree planting has been the responsibility of the Basuto Administration. The scheme has not proved an outstanding success. There has been a slight increase in the number of trees planted as compared with the previous year i.e. 41,735 trees as compared with 39,900 the year before. The total cost of tree-planting and maintenance of old plantations was £376.

(6) *Grass Planting*

£717 has been spent on this important aspect of conservation work. Kikuyu grass is planted on all dam walls and hundreds of dongas have been stabilized by its use.

(7) *Spillways and Meadow Strips*

Five meadow strips have been beaconed off. Without adequate fencing it is difficult to maintain them in good order, as farmers are always tempted to use them as roadways for sledges, and as stock routes.

(8) *Beaconing of Dongas*

As will be seen in production table above, 447 miles of dongas have been beaconed. The cost of labour and whitewash was £201. The work has now been confined to areas where construction gangs are operating. Because in some districts chiefs have not co-operated well beacons have been removed.

L. H. Collet,
Reporting Officer

PART II

RESEARCH AND INVESTIGATION

SECTION I

PILOT PROJECT

Descriptions of work in progress given in the previous annual report on this scheme apply also to the year under review save as augmented or amended in the present report.

1. RECLAMATION

(1) *Soil Conservation*

Works constructed from 1st April 1953 to 31st December 1955 :

Soil Conservation Bunds (mechanically constructed) . .	373,498 yds	(3,735 acres)
Buffer (Grass) Strips (marked out using land-owners' own oxen)	1,056,651 yds	(4,372 acres)
Diversion furrows above cultivated land	15,110 yds	(604 acres)

Construction of stone silt barriers in gullies and on denuded slopes, and planting of kikuyu grass and *Agave* have continued.

(2) *Dams*

The total number of dams is now 16, with a capacity of 7,406,500 gallons. This includes a few small village dams (see under Community Development).

(3) *Tree Planting*

Estimated number of trees planted since 1st April 1953 and surviving at 30th September 1955 :

Deciduous,	i.e. Poplar, Willow, *Acacia*, *Gleditsia*	1,500	
	Osier Willow	800	
	Peach	600	2,900
Coniferous,	i.e. Pine, *Cedrus deodara* and *Cupressus arizonica*		700
			3,600

An attempt is being made to promote a small osier industry (manufacture of baskets, chairs, tables, etc., for which there is a ready demand in the Territory). The majority of the osier willows have been issued to and planted by individuals, and it is hoped to train a few Basuto in the preparation and use of osier rods.

A tree nursery has been established at Monethes, from which seedlings are issued to the public.

(4) *Grazing Control*

Grazing control is now in force throughout the foothills and in some parts of the lowland area (i.e. over approximately 20 square miles). Co-operation by the chiefs and people has improved.

2. DEMONSTRATION

(1) *Agricultural Extension Work*

As described in last year's report, extension work has begun to yield promising results, particularly in the upper valley where production has been improved – in some cases spectacularly – mainly by the increased use of farmyard manure and fertilizer. 84 bags of fertilizer were sold to individual farmers during the year (directly and through the new Co-operative Society) as compared with 35 bags last year.

(2) *Observation and Demonstration Plots*

Despite some failures due to the poor season and imperfect co-operation by farmers, and in a few cases destruction of the crop by goats, these have served their purpose. Plots treated with phosphatic fertilizer were clearly shown to yield often twice as much as those without, and the effect of lime on red foothill soils was also evident. Actual quantitative data from these plots are of little interest and add nothing to technical knowledge : the point is that being on the peasants' lands the visible results were of considerable interest to the peasants themselves. It is hoped to improve these visual demonstrations further in the next season's trials. Results of potato trials were somewhat disappointing, mainly owing to drought, but they will be repeated in the coming season.

(3) *Carts*

Eight different types are available for resale. Interest has quickened in the last year, outside as well as in the Tebetebeng valley, and carts are now distributed in many parts of the Territory, by the Pilot Project. 78 carts have now been issued, as compared with 10 as at 31st December 1954. The main problem latterly has been to keep pace with the demand as funds provided in current estimates have been insufficient. Other means of financing this scheme are under consideration : there is no particular difficulty, so far, in recovering payment from purchasers.

(4) *Livestock Improvement*

As the Tebetebeng valley is not a self-contained unit in regard to livestock (i.e. stock is moved into and out of the area) less progress is

possible here than in agriculture, and the problem can be tackled thoroughly only on a territorial or regional basis. Nevertheless individual cattle-owners who are anxious to raise the quality of their herds – a small but slowly growing class of farmer – are assisted as far as possible. Five Brown Swiss bulls are now at stud on the system outlined in the last report, but it is proposed to make fuller use of them by running them with closed village herds, as insufficient heifers are brought for service under the present arrangement. In regard to sheep and goats no special steps have been taken, existing improvement plans for the Territory as a whole being applied through the district and dip tank area organizations.

3. INVESTIGATION

(1) *Co-operative Mechanized Farming*

The second season saw encouraging progress in some directions, although both Government and the farmers have still much to learn about efficient management of mechanized groups under local conditions. There is now a better understanding amongst the members of the objects and obligations of the system and appreciation of its advantages. A much greater proportion of the members turned out for inter-plant (hand) cultivation and for treatment of maize against stalkborer than in the first season. Prolonged drought in the spring and early summer, followed by premature frosts in autumn, depressed yields ; nevertheless, as the table below shows, members of all groups harvested considerably more per acre than their neighbours, and in most cases the return was more than sufficient to cover the outlay, leaving a substantial net gain.

The group committees now play a somewhat larger part in the conduct of farming operations, although the secretaries are mostly far from competent. It is clear that each group needs a competent manager-cum-secretary, or a manager and a secretary, drawn from the membership and paid by the group.

The standard of work done by drivers has improved, but there is great need of more frequent and thorough training courses for committee members as well as drivers if both work and maintenance are to be efficient. For this reason, and in order to permit of timely repairs and overhauls, the mechanic-supervisor attached to Schemes D. 2204 and D.2205 is now stationed at Teyateyaneng, which is central for all mechanized groups under these schemes, instead of at Maseru.

Costs for the second season were similar to those given for the first season, but are not reproduced in this report as certain modifications in the costing system are being carried out as the result of consultations with representatives of the National Institute of Agricultural Engineering. These are being made in the light of experience gained since the beginning of the scheme, but do not involve any radical changes. It has always been stressed however that at least five years working is necessary before completely realistic figures can be provided.

By the end of the second season a total of approximately £194 had been collected by the four groups to the credit of Cultivation Charges and Replacement of Machinery Accounts. The balance due by members was £1,652. During these first two seasons it had been necessary to in-

troduce farmers gradually to the objects and obligations of the scheme, and to give them a reasonable opportunity to convince themselves that tractor cultivation was worth the effort and money. The stage has now been reached, however, where it is both feasible and necessary to take a much firmer line over the payment of cultivation charges : but before this season few of the cautious and conservative Basuto peasantry would have been willing to pay money in advance for such novel purposes, despite the evident attractions of tractor cultivation.

This season the tractor service has been provided only for those farmers, holding fields within a reasonable radius of the society's headquarters, who make a cash payment in advance. The risk of course is that as a result the hitherto compact groups may be broken up into uneconomic fragments ; to counteract this to some extent, it is a condition that only blocks of at least 15 acres will be cultivated by tractor. The areas of the groups under this arrangement are 93, 121, 103 and 85 acres respectively, each group consisting of a number of blocks of 15 acres or more. The disadvantages of course are higher running costs and reduced efficiency, but against these must be set the improvement in collection of cultivation charges and in average quality of membership. For example the committees have now collected £544 from their members, against the previous and current seasons' liabilities totalling £1,432 ; and the committees have been somewhat strengthened by the election of new and more active members. Whether or not there has been a net gain from these changes remains to be seen.

The next step in the introduction of mechanized agriculture into Basutoland – i.e. succeeding the present experimental stage – is under consideration by Government, following on a visit by Mr. B. J. Surridge, Adviser on Co-operation to the Secretary of State for the Colonies.

The economic use of group tractors outside the main cycle of operations is being explored, e.g. ploughing for a wheat crop and transport of maize at harvest.

Maize yields in mechanized groups

(in bags of 200 lb. grain per acre)

Group	1953–54		1954–55	
	Group lands	Non-group lands	Group lands	Non-group lands
Mesapela	2·21	1·75	2·68	0·08
Thaba Chitja	6·35	?	5·67	5·37
Rampepes	9·13	6·99	8·09	4·38
Malimong	4·23	2·03	8·00	1·76

(2) *Irrigation*

Delays have occurred in the pilot irrigation scheme referred to last year, mainly owing to damage and waterlogging caused by heavy rains last summer, before earthworks had been consolidated. Lucerne will be sown in the trial plots at the next opportunity (March 1956). The plots now being prepared have been increased to four because of the keen

interest shown by the landowners concerned. The intention remains however to confine this scheme initially to a very small trial area.

Three trial fish ponds have been established below the Khohlong dam : two have been stocked with trout and black bass respectively : the third will be stocked with carp or *Tilapia*.

4. COMMUNITY DEVELOPMENT

The Tebetebeng Farmers' Co-operative Society now has 60 members and is beginning to serve a useful purpose by providing farmers' requirements, particularly of fertilizers and seed. The Society will eventually become the principal medium of supply also for the mechanized groups' tractor fuel and other requisites : the question of marketing through the society is more difficult and is still under consideration.

13 village water supplies have now been improved with the assistance of the keener villagers, and the demand may be expected to continue.

Trials have been carried out of various types of small earth-moving machinery designed for use with Ferguson tractors attached to mechanized farming groups, the objects being (a) to provide useful work for these tractors when there are no agricultural operations to be carried out, (b) to encourage vegetable gardening at or near the villages, where there are supplies of kraal manure, by the provision of small dams constructed jointly by village effort and the group tractors. This work has been handicapped by breakdowns of the dam scoops.

Young Farmers' Clubs with a total membership of 370 have made initial progress, both in gardens and fields.

The introduction of osier willows has been referred to under "Tree Planting". Schools have continued to plant trees, grass and reeds, and have also helped to plant potato demonstration plots. Construction of stone silt barriers has continued. All this work is necessarily on a small scale but is of educational value, though the problem remains of stimulating like effort amongst adults. Nevertheless, the neighbouring villages contributed free voluntary labour to the construction of a new road (approximately 5 miles in length) in the upper part of the valley ; and in the Thaba Chitja area the people have raised over £30 for an extension to the local school, which will also serve as a community centre. This kind of development is possible only where there is vigorous local leadership, and it remains true that in a community of which more than half the adult males are absent, only limited "self-help" can take place, if energetic and efficient chiefs and popular initiative lacking. But even limited activity of the kind here described is emphatically worth while, not least as a training for future councillors and officials.

As a preliminary to a more intensive campaign to improve nutrition a survey of 2,500 children has been carried out by a medical officer. It is hoped to co-operate with a World Health Organization Scheme next year.

5. PUBLICITY AND EXTENSION

Approximately 430 Basuto, mostly in parties, have visited the Pilot Project to date, the majority on their own initiative, and of these 320 visited the scheme during the year under review, evidence of growing interest. Day and weekend tours have been the most popular but longer visits are to be encouraged. Parties embrace chiefs and headmen, Basutoland and district councillors, teachers, farmers, students, school children and Government servants from several districts and departments. A start has been made with the secondment of agricultural staff from districts to the scheme. The quarterly newsletter is widely distributed and appears to be generally read with interest. Photographs are displayed by this and other means, but it has not yet been possible to prepare and exhibit films and film strips. The distribution of carts throughout the Territory has already been mentioned.

Some progress has thus been made in the very important matter of extending the results of the Pilot Project to the rest of the Territory; but it has to be borne in mind that hitherto the emphasis has necessarily been on developments in the Tebetebeng valley itself, and that in such matters as mechanized group farming which are still experimental it is not desirable to encourage actual emulation at the present stage.

6. OPERATION OF THE SCHEME

The inter-departmental Pilot Project team is based at Monethes near the centre of the area, which is divided for most purposes into three sub-areas, each under the charge of an agricultural demonstrator. As a portion of the ward of 'Mamathes' however, the area (only 62 sq. miles in extent) falls under no less than 30 petty chiefs and headmen of greatly varying calibre, each responsible direct to the Ward Chief. This makes control by the chieftainship and co-ordination of development complicated and inefficient. Efforts are being made to secure the appointment of a co-ordinating agent of the chieftainship, for the area as a whole. But this alone cannot ensure that works carried out in the Pilot Project, and essential services without which no farmer can really be efficient, will be supported, maintained and expanded by the local Basuto authorities, before and after the expiry of the present C.D. and W. scheme. For example soil conservation works and roads must be maintained, grazing controlled, tree plantations preserved. These are problems of local government rather than of agricultural development, but they must be solved if the Basuto people are to derive the maximum benefit from the scheme. The slow but steady improvement in the farming practice and living conditions of the more progressive families in the Tebetebeng valley, and the growing interest shown in the scheme by Basuto from other parts of the Territory, prove that the potential value of the Pilot Project is great.

A. Douglas,
Reporting Officer.

SECTION II

MECHANIZED GROUP FARMING

At the present moment there are in addition to the four groups in Pilot Project seven mechanized groups operating in the Berea and Leribe districts. Three of these were started in July 1955 and four in the previous year. One of these latter however was closed, and restarted under new management during 1955.

The groups are widely scattered, but not so widely as to be unmanageable by the Agricultural and Livestock Officer in charge of the project.

It is early yet to say whether or not the people who participate in the experiment fully appreciate its final aims and objects, and just what their own commitments are going to be when they reach the stage of running and managing their own group.

1. GROUP ORGANIZATION

Each group is controlled by a chairman, a secretary and three committee members. As is true of any co-operative venture, a keen, forceful and practical committee normally produces a healthy industrious society. Unfortunately the necessary drive and enthusiasm is lacking in some of the group committees, and as a consequence some groups tend to appear lethargic and dis-interested. Attempts are being made to find chairmen who can also act as tractor drivers. Under such circumstances groups will be permitted to pay the chairmen wages as tractor drivers. Naturally such persons must own lands within the group in which they operate. In one of the groups where this has been done the combination of duties works very well indeed.

All groups are now registered under the Basutoland Co-operative Societies Proclamation as Farming Societies, and all operate banking accounts or Post Office Savings Bank trust accounts.

Each group has helped to build a tractor shed and store at its headquarters, the groups supplying the labour, and the Scheme the material.

It has been found that an area of approximately 200 acres is as much as can be conveniently dealt with by one tractor.

It is now insisted that groups shall obtain prior payment for all cultivations to be carried out on members' lands. At first it was thought that this principle might lead to people deserting their groups, but as the season progressed cultivators found the money to pay, and seemed satisfied to return.

2. CROPS ON GROUP LANDS

Although 1955 has not been a good year for maize growing there appears little doubt that the people served by machanized groups will in the long run benefit.

One of the main reasons for improved crops is the application of phosphatic fertilizer with the seed ; another is the timeous cultivation which can be effected with a tractor operating on a reasonably small acreage.

The difficulty in dressing for stalk borer has not yet been tackled mechanically, but investigations involving the use of a low volume spray are being conducted.

Table showing estimated maize yields 1954–55

(In bags of 200 lb. per acre)

Estimated yield on group lands	*Estimated yield on lands outside but bordering groups*
1. Manganeng 5½	1½
2. Corn Exchange 3½	Nil.
3. Lovely Rock. 3	Nil.
4. Peka 2	2

Groups 1, 2 and were treated with 120 lb. of supers to the acre. The Peka group refused to pay for an application of fertilizer.

Maize being the basic diet of the Basuto, most of the work at present done by the groups deals with the preparation of land for and the cultivation of this crop. As a start towards introducing a crop rotation people are encouraged to plant beans on lands which have previously grown maize. Because beans are acceptable as a foodstuff and sell well as a cash crop this stage of the introduction has been relatively easy. Beans respond readily to phosphatic fertilizer and yields within and outside groups compare in much the same way as those for maize.

During the off seasons tractors are hired out to members of groups for transport work.

GENERAL CONCLUSIONS

It may be said that where groups have active, go-ahead committees and where full payment for work to be done is collected the groups stand a good chance of survival. There is every reason to assume that the Basuto appreciate the advantages to be derived from a well organized tractor group but what they are unable to grasp with equal celerity is the fact that they themselves are the people who will eventually control and run that group. The guiding hand of Government can only be removed slowly in order that it may be replaced by their own.

A. Gibson,
Reporting Officer.

SECTION III

SOIL AND CROP RESEARCH

1. GENERAL

(1) Description

This report covers the third season of field experiment work in Basutoland in the Colonial Development and Welfare Fund assisted research scheme (Scheme R. 495). The report for 1953 dealt with the establishment of the Maseru Experiment Station and eleven small substations and the results of a set of exploratory N.P.K. trials. The report for 1954 included the results of the first season of a full experiment programme, when the problems faced in arable agriculture in Basutoland, the lines of approach followed towards their solution and the exeperiment techniques used were described in some detail.

Exploitive cropping over a century has reduced the fertility of the soil in most of the important farming areas in Basutoland, and the yields obtained to-day are poor.

In the 1954 report on the Scheme attention was drawn to the fact that over the last 18 years the average annual deficit in maize production in the Territory was 100,000 bags of 200 lb. each. As maize is the staple food of the Basuto the need to increase production per unit area (the area of arable land cannot be extended) is evident.

In brief, the Scheme consists of a field experiment programme, backed at present by a very limited amount of laboratory analytical work, of investigations into problems of soil infertility and including a search for optimum varieties of the four main crops for each of the three ecological zones.

The work is carried out on a central station at Maseru and on a set of 10 small substations, or District Experiment Plots, so sited as to be representative of the three pedo-ecological zones and to give good geographical coverage. A new feature of the programme is co-operative experimentation carried out on peasant holdings.

Operations are centralized with all planting, treating, harvesting etc. carried out by the peripatetic main station staff. A mobile self contained mechanical unit is used for ploughing, cultivating and produce transportation on eight of the ten stations. On the two stations inaccessible by road animal draught is used.

(2) Staff

The research staff consists of the Soil Fertility Officer (A. C. Venn), Agricultural and Livestock Officer (V. S. Gilbey), Experiment Assistant (vacant), one clerk, three experiment recorders and a gang of labourers. At the end of September Mr. C. M. H. Morojele, Experiment Assistant, resigned from the Service to continue his studies overseas. He had

TABLE I

Rainfall at Maseru Experiment Station and District Sub-Stations 1954/55

(Inches)

Station	1954												1955						Total A	Total B	Total 1954
	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June			
LOWLANDS																					
Leribe	6·35	4·51	5·56	1·39	1·59	0·11	0·04	–	0·39	0·90	2·62	3·08	3·49	13·68	2·57	3·50	2·71	0·69	19·19	30·27	26·54
Berea	3·71	4·25	5·42	0·69	2·15	0·15	–	–	0·26	0·16	2·84	2·92	12·26	6·31	2·44	1·96	2·14	0·85	18·84	29·15	22·55
Maseru	2·01	3·86	6·54	0·91	1·02	0·14	–	–	0·31	3·27	1·98	9·72	6·78	3·00	2·39	1·20	0·58	18·03	27·75	20·04	
Matsieng	2·47	4·42	6·66	0·65	0·99	0·21	–	–	0·08	1·06	1·66	3·58	8·10	7·42	2·89	1·97	2·08	0·90	17.31	26·76	19·78
Mafeteng	0·58	3·73	7·42	2·05	1·09	–	0·33	–	0·09	0·04	1·64	4·70	8·22	6·67	2·56	3·28	1·30	0·49	21·09	27·53	21·67
Mohale's Hoek	2·24	4·63	4·66	2·88	2·11	0·24	0·46	0·01	1·18	2·76	3·87	4·19	8·38	8·96	2·33	3·76	0.98	0·59	27·04	35·90	29·28
Fort Hartley	2·98	4·64	5·20	1·17	–	–	0·30	–	0·80	0·20	0·14	7·14	7·61	4·58	1·17	2·46	3·67	1·22	15·23	19·40	17·57
FOOTHILLS																					
Qalo	2·87	6·06	3·84	1·76	1·16	0·46	–	–	·99	·25	3·72	3·96	6·13	7·73	2·16	2·43	1·45	0·25	22·20	27·37	25·07
Machache	3·20	5·49	6·67	1·67	2·61	–	–	–	–	·79	3·40	4·74	4·23	17·64	5·15	2·29	1·75	0·78	25·37	38·24	28·57
Malealea	2·22	3·11	3·93	2·79	1·70	–	–	–	0·30	·42	2·29	3·12	4·93	13·77	3·20	1·00	2·16	0·40	17·66	29·03	19·88
MOUNTAINS																					
Mokhotlong	3·00	2·77	2·51	0·18	1·42	0·13	–	–	0·54	1·61	2·99	3·46	3·45	4·38	1·27	2·03	0·65	0·33	12·50	19·73	15·50
Qacha's Nek	5·74	9·36	5·14	3·22	2·33	0·73	0·28	–	2·57	2·76	4·51	5·20	9·01	4·32	5·70	1·90	0·45	0·41	34·79	36·25	39·51

Period effective rainfall Lowland wheat (Total A.)

Period effective rainfall Foothill and Mountain wheat, all maize, sorghum, etc. (Total B.)

rendered very useful service, inter alia controlling the experiment programme during the period January – March when the Soil Fertility Officer was absent on leave and handling a great deal of statistical work.

(3) Climate Conditions

See Table 1. Conditions during the year were adverse. The spring rains were followed by a severe drought (necessitating the replanting of experiments at four stations) which in January was broken by unprecedentedly heavy rains, 19 inches, for example, falling during a 30 day period at Maseru. Bean and potato experiment crops were drowned and all other crops suffered. On April 7th a hard early frost took a large proportion of the Basuto crop, including nearly all sorghum. The mean yield of 1·83 bags per acre for untreated plots from the series of co-operative experiments carried out in Basuto fields (Table 23) is probably indicative as much of the climatic conditions that obtained as of the fertility status of the soils.

2. THE EXPERIMENTS

During the year 62 experiments were planted on the stations, covering 3051 plots including 324 micro plots. The amount of crop selection work was reduced compared with 1953-54 while the soil investigational programme was increased slightly. A further 16 small fertilizer trials (192 plots) were carried out by junior field staff on Basuto farms. Table 2 below gives some details of the programme.

TABLE 2

	Station Experiments			*Co-operative Experiments*		
Crop	*No. of Expts.*	*No. of Plots*	*No. of Losses*	*No. of Expts.*	*No. of Plots*	*No. of Losses*
Maize. .	23	1188		16	192	3
Wheat .	21	1117	5	–	–	–
Sorghum.	12	478	2	–	–	–
Beans. .	2	128	2	–	–	–
Linseed .	1	36	–	–	–	–
Potato .	1	32	1	–	–	–
Castor .	1	32	–	–	–	–
Mixed .	1	40	–	–	–	–
Maseru .	23	1239	4	–	–	–
Districts .	39	1812	6	16	192	3

All station experiments are planted and treated by hand, a high degree of precision being demanded. However, in spite of the care taken coefficients of variation of summer experiments were on the whole very high. This is probably partly because of the multiple dissection of lands in Basutoland by contour banks and "vertical" land boundaries, necessitating the use of broken and ill shaped blocks, and partly as a result of the

flooding in January and February, when stands on low lying plots were reduced through lodging and rotting.

To facilitate organization stations and experiments have been allocated symbols. The symbol for an experiment gives station, crop, and type of trial in that order. Lowland stations are numbered 1 to 6, those in the foothills 7 to 9 and that at Mokhotlong, in the mountains, 10. These symbols are used below for reference purposes.

The NPK Exploratory Series

(1) *Description*

In a survey of major soil deficiencies a set of exploratory experiments was laid out (for the third year) on the substations, so covering all important soil types and ecological regions. Of the 32 experiments planted 11 were on maize, 12 on wheat and 9 on sorghum. No sorghum trial was planted at Mokhotlong, where an additional wheat experiment was included.

Arrangement: At Mokhotlong ; two replicate $3 \times 3 \times 3$ factorial designs in 6 blocks of 9 plots each. On all other stations ; single replicate $3 \times 3 \times 3$ factorial designs in 3 blocks of 9 plots each. In most trials an additional no treatment plot was included in each block. These do not enter the analyses.

Treatments: Factorial combinations of three rates of nitrogen (N0, N1, N2), three rates of phosphate (P0, P1 and P2) and three rates of potash (K0, K1 and K2), where :

N0 = No nitrogenous fertilizer.
N1 = 20 lb. N per acre as Sulphate of Ammonia.
N2 = 40 lb. N per acre as Sulphate of Ammonia.
P0 = No phosphatic fertilizer.
P1 = 25 lb. $P_2 O_5$ per acre.
P2 = 50 lb. $P_2 O_5$ per acre.
{As 1 : 1 mixture Raw Rock and Supers for soils of pH below 6·0 : as Supers for soils of pH above 6·0
K0 = No potassic fertilizer.
K1 = 15 lb. $K_2 0$ per acre as Muriate of Potash.
K2 = 30 lb. $K_2 0$ per acre as Muriate of Potash.

Time and method of application: P and K for row crops was drilled 2 to 3 inches below the seed, while N was applied 6 weeks after planting, placed in a band 3 inches from the row on the uphill side. On wheat experiments P and K were broadcast and disced in deeply before planting while the N was spread at the stooling-before-piping stage.

Plot Sizes – Maize: Gross 62′ × 21′; Nett :58′ × 15′. *Wheat and Sorghum* : Gross 60′ × 15′ ; Nett : 54′ × 9′.

Spacing: – Maize: 2 feet apart in 3 foot rows. Three seedlings thinned to one per hill. *Sorghum:* 9 inches apart in 3 foot rows. Five seedlings t hinned to one per mark. *Wheat:* broadcast at 40 lb. per acre in the lowlands and 80 lb. per acre in the high country.

Varieties. – *Maize:* American White Flint in the lowlands. Cincinatti Bushman in the foothills and mountains. *Sorghum:* Tennant White. Trials that failed to germinate replanted to Texas Martin. *Wheat:* Scheepers and Red Spitzkop in the lowlands, Talberg in the foothills and mountains.

Soil Types – Lowlands: Various sandy loams (pH values 4·8 – 6·0) and an alluvial clay, pH 6·2. *Foothills:* Ferruginous red loams, pH 5·3 – 5·8. *Mountains:* Mountain Black clays; pH ± 6·4.

Cultivation. – Row Crops: 2 hand and 2 implement cultivations. *Wheat:* None.

Insecticides and Fungicides: All seed treated with mercurial dust. All maize and sorghum twice dusted with DDT powder.

Results: See Tables 3, 4, 5 and 6.

(ii) *Discussion (N.P.K. Series)*

(a) *Maize* Grain (see Table 3). Significant positive linear responses to phosphate are recorded in nine of the eleven experiment results, while six show negative curvatures in addition. At these centres 100 lb. of fertilizer per acre was more effective, per unit of phosphate, than 200 lb. per acre. As was the case in previous years no response to phosphate was obtained at Mokhotlong on a typical "Mountain Black Clay".

Excluding the results from the Fort Hartley station, where the soil is a fertile riverine alluvial clay, representing a type of very limited extent in Basutoland, the mean response to 200 lb. of the 1 : 1 phosphate mixture per acre in the Lowlands and Foothills was 5·20 bags per acre; - a response of slightly more than half a ton of grain per acre, or a mean increase of 367 per cent.

In 1953-54 only two responses to nitrogen were recorded in the maize N.P.K. series. The rates of application of sulphate of ammonia were doubled for the 1954-55 experiments (N2 = 40 lb. N per acre) but in spite of this a response to nitrogen appeared at only one centre, Leribe, where it was measured for the third successive year. A positive NP linear interaction is also recorded at Leribe. Apart from this and two small negative NK interactions (Leribe and Matsieng - doleritic red sandy loam) the two factor interactions are small and non significant. There are no responses to potash.

(b) *Sorghum* Grain (see Table 4). With the exception of Fort Hartley large positive responses to phosphate are measured at all stations on which crops were harvested. The mean response, over six centres, to an application of 50 lb. P_2O_5 per acre, is 3·65 bags per acre. There is once again a trend towards general negative P curvatures.

Two responses to nitrogen are recorded, that at Leribe, like the maize response, appearing for the third successive year.

The linear interactions are small and generally non significant.

(c) *Wheat* (a) Grain (see Table 5). The Lowland winter wheat crop was good. At Leribe, however, the ripe standing crop was wiped out

TABLE 3

Maize

1. Grain in 200 lb. bags per acre

Station and Stn. No.	Mean Yield	Coef. of Var. %	Mean yield: plots without N	P	K	Linear Responses N	P	K	SE±	Curvatures N	P	K	SE±	Linear Interactions N'P'	N'K'	P'K'	SE±
LOWLANDS																	
Leribe . . .	4·70	20·00	3·57	0·82	4·92	+2·07	+6·68**	−0·11	0·64	−0·57	+2·92**	+1·0	0·77	+2·01**	−0·96*	−0·35	0·54
Berea . . .	4·26	25·30	3·99	1·07	3·60	+0·28	+5·38**	+0·51	0·51	−0·82	−3·01**	−0·09	0·38	+1·00	−0·58*	+0·88	0·62
Matsieng . .	6·49	12·00	6·59	2·41	6·64	+0·04	+6·53**	−0·13	0·37	+0·55	−4·88**	+4·78**	0·64	+0·28	−0·96	+0·35	0·45
Mafeteng (1) .	3·68	37·30	3·69	2·37	3·28	−0·18	+2·16**	+1·09	0·65	−0·50	+1·37	+0·90	1·12	−0·60	−0·67	−0·52	0·79
Mohale's Hoek	5·48	43·30	4·37	3·25	6·07	+1·26	+3·57**	−0·77	1·11	−0·73	−3·67	+1·22	1·94	−0·57	+0·81	+0·43	1·37
Fort Hartley .	12·62	12·90	12·17	12·74	12·74	+0·59	−0·16	−0·37	0·77	−0·97	+0·22	−0·40	1·33	−0·65	+1·31	+0·17	0·84
FOOTHILLS																	
Qalo . . .	7·77	20·20	7·55	1·83	8·19	−0·04	+10·36**	−0·30	0·74	−1·44	−4·57**	+1·63	1·28	+1·68	+0·27	+1·63	0·91
Machache . .	5·12	19·50	5·01	1·52	4·88	+0·33	+6·26**	+0·32	0·47	+0·29	−2·79*	−0·47	0·81	−0·52	−0·44	+0·91	0·57
Malealea . . .	4·57	21·20	4·92	2·36	4·19	−0·75	+3·78**	+0·58	0·46	−0·15	−1·94	−0·51	0·51	+0·53	−0·49	−0·13	0·56
MOUNTAINS																	
Mokhotlong . .	3·08		5·89	5·91	6·28	+0·83	−0·07	−0·11		+0·84	−1·73	+0·35		+0·06	−0·65	+0·21	
LOWLANDS																	
†Mafeteng (2) .	2·03	35·90	2·00	0·97	2·06	+0·37	+2·04**	0	0·34	+0·93	+0·93	−0·24	0·57	+0·92	−0·25	−0·32	0·62

* Significant at level P = 0·05 ** Significant at level P = 0·01.

† Quick maturing maize planted on site of Experiment 4 SE after two sorghum crops on that site failed.

TABLE 4

Sorghum

1. Grain in 200 lb. bags per acre

Station	Mean Yield	Coef. of Var. %	Mean yield: plots without N	P	K	Linear Responses N	P	K	S.E±	Curvatures N	P	K	SE±	Linear Interactions N'P'	N'K'	P'K'	SE±
LOWLANDS																	
Leribe	4·21	16·60	2·98	1·70	4·49	+2·26**	+4·05**	−0·59	0·33	−0·60	−2·91**	−0·13	0·57	+1·41*	−0·54	−0·16	0·60
Berea	2·83	28·60	2·71	2·43	3·04	+0·39	+4·15**	−0·23	0·38	+0·44	−3·09**	+0·50	0·66	+0·76	−0·22	0	0·47
Matsieng	2·46	36·10	2·76	0·20	2·41	−0·56	+3·60**	−0·08	0·42	+0·13	−2·76**	−0·50	0·72	−0·57	−0·28	+0·24	0·51
Mafeteng†		Crop	Failure														
Mohale's Hoek	14·60	Crop	Failure														
Fort Hartley	14·60	11·70	14·18	13·98	13·74	+0·33	+0·89	+0·74	0·86	−1·29	−0·78	−2·69	1·49	−0·63	−1·96	−1·41	1·05
FOOTHILLS																	
Qalo	4·80	23·10	4·65	0·57	5·15	+0·30	+7·74**	−0·06	0·51	−0·64	−2·78**	+1·30	0·89	+0·65	+0·73*	−0·55	0·63
Machache	1·17	35·90	1·07	0·31	1·41	+0·42*	+1·50**	−0·49*	0·20	+0·65	−0·67	−0·04	0·34	−0·07	−0·60	+0·07	0·24
Malealea	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

* Significant at level P = 0·05.
** Significant at level P = 0·01.
† Quick maturing maize planted after two sorghum crops failed. Results tabulated in Table 3.

TABLE 5

Wheat

1. Grain in 200 lb. bags per acre

Station	Mean Yield	Coef. of Var. %	Mean yield: Plots without N	P	K	Linear Responses N	P	K	S. E±	Curvatures N	P	K	S.E±	Linear Interactions N'P'	N'K'	P'K'	S.E±
LOWLANDS																	
Leribe		Crop	Failure														
Berea	5·45	13·20	5·97	3·30	5·43	—1·03	+ 3·92**	—0·02	0·34	+ 0·04	—1·14*	—0·16	0·59	+ 0·02	—0·16	—0·28	0·41
Matsieng	3·50	16·70	3·60	1·73	3·44	—0·28	+ 2·65**	+ 0·11	0·27	—0·20	—2·63**	+ 0·02	0·46	+ 0·11	+ 0·65	—0·24	0·34
Mafeteng	2·30	22·90	2·37	2·06	2·24	—0·13	+ 0·56*	+ 0·07	0·25	—0·01	+ 0·20	—0·18	0·43	+ 0·12	+ 0·14	—0·36*	0·30
Mohale's Hoek	4·84	12·00	4·80	4·73	4·74	—0·13	+ 0·14	+ 0·34	0·27	—0·62	—0·20	+ 0·48	0·47	—0·51	—0·07	+ 1·00	0·33
Fort Hartley	4·65	16·60	4·98	4·67	4·56	—0·84*	+ 0·21	—0·06	0·36	—0·53	+ 0·73	—0·72	0·63	—0·75	—0·01	+ 0·19	0·45
FOOTHILLS																	
Qalo	2·73	21·80	2·58	1·57	2·51	+ 0·61	+ 2·07**	+ 0·24	0·28	—0·43	—0·76	—0·60	0·49	+ 0·34	—0·09	+ 0·30	0·34
Machache		Crop	Failure														
Malealea		Crop	Failure														
MOUNTAINS																	
Mokhotlong		Crop	Failure														

* Significant at level P = 0·05. ** Significant at level P = 0·01.

TABLE 6

Wheat

2. Straw in short tons per acre

Station	Mean Yield	Coef. of Var. %	Mean yield: Plots without			Linear Responses				Curvatures				Linear Interactions			
			N	P	K	N	P	K	S.E±	N	P	K	S.E±	N'P'	N'K'	P'K'	S.E.±
LOWLANDS																	
Leribe		Crop	Failure											+0·01	—0·01	0	
Berea	1·02	21·50	1·07	0·54	1·00	—0·04	+0·76**	+0·03	0·10	+0·19	—0·56*	+0·020	·16	+0·02	—0·03	—0·06	0·12
Matsieng	0·48	14·70	0·49	0·33	0·48	—0·01	+0·25*	—0·01	0·03	+0·09	—0·13	+0·030	·06	0	+0·05	—0·03	0·04
Mafeteng	0·28	24·20	0·30	0·23	0·28	—0·02	+0·09*	+0·02	0·03	+0·01	0	+0·040	·05	+0·04	—0·01	—0·05	0·04
Mohale's Hoek	0·70	14·00	0·63	0·63	0·71	+0·09*	+0·10*	—0·06	0·05	—0·12	—0·12	—0·100	·08	—0·02	+0·11	—0·01	0·06
Fort Hartley	0·89	8·00	0·90	0·82	0·83	—0·04	+0·13**	+0·06	0·04	—0·13	—0·01	—0·170	·06	—0·01	—0·01	+0·04	0·04
FOOTHILLS																	
Qalo	0·37	14·18	0·37	0·19	0·38	0	+0·34	—0·04	0·03	+0·01	—0·02	—0·060	·04	+0·01	—0·01	0	0·03
Machache	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Malealea	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
MOUNTAINS																	
Mokhotlong	1·77	11·90	1·62	0·99	1·79	+0·31	+1·42**	—0·06	0·10	+0·02	—0·38*	+0·020	·18	+0·10	—0·18	+0·04	0·13

* Significant at level P = 0·05.
** Significant at level P = 0·01.

by hail. Hail damage and subsequent weed infestation caused the failure of two Foothill trials. At Mokhotlong, although the straw grew to 4 feet, no grain was borne. The crop had been sprayed with a selective weed-killer and faulty calibration may have led to too heavy an application of 2·4D being applied, which no doubt affected the seed setting.

Excluding the Fort Hartley result the mean response to the P2 treatment is 1·89 bags per acre (378 lb. per acre). Two negative phosphate responses are recorded. The two factor interactions are small and of no interest.

(b) *Straw.* Phosphate applications increased the yield of straw at all centres. Nitrogen and potash had little effect.

(2) Other Fertility Studies

(i) *General*

(a) *Time and method of treatment applications:* Unless otherwise stated, nitrogen, phosphate and potash as for NPK series. Lime and manures applied broadcast in late winter and ploughed in.

(b) *Spacing and seeding:* Unless otherwise stated, *Maize:* plants 2′ apart in 3′ rows. *Sorghum:* plants 9″ apart in 3′ rows. *Wheat:* broadcast at 40 lb. per acre.

(c) *Plot sizes:* Unless otherwise stated, *Maize:* 62′ × 15′ reduced to 58′ × 9′ for harvesting. *Sorghum and Wheat:* 60′ × 15′ reduced to 54′ × 9′ for harvesting.

(d) *Varieties – Maize:* Mountains and Foothills, and Lowland trials at Maseru, Cincinatti Bushman; district Lowland trials, American White Flint. *Wheat:* Mountains, Talberg; Lowlands, Scheepers. *Sorghum:* Tennant White.

(e) *Cultivations:* Normally two hand and three implement cultivations for row crops.

(f) *Insecticides and Fungicides:* All seed treated for smut with mercurial dust. All maize and sorghum twice dusted with D.D.T. against stalk borer.

(ii) *Fertility Experiments including Lime Treatments*

(a) *M.D.P.L. Series:* Two experiments in a fundamental study on maize were repeated on two different soil types to :

(i) Compare the effectiveness, on a total P_2O_5 basis, of Kraal manure and a phosphatic fertilizer.
(ii) Examine the effect of lime on two very different important soil types.
(iii) Investigate the possibility that increased efficiency in phosphate utilization would be brought about by liming.

One experiment was planted at the main sub-station at Machache in the Foothills (8.M.D.P.L.), and one at Maseru (Ex. M.D.P.L.).

Arrangement: Two replicate, three cubed factorial designs in 6 blocks of 9 plots each.

Treatments: Factorial combinations of three rates of total P_2O_5 applied as kraal manure (D0, D1 and D2),three (the same) rates of total P_2O_5

applied as 1 : 1 Super-Raw rock phosphate fertilizer (P0, P1 and P2) and three rates of high carbonate agricultural lime (L0, L1 and L2), where :

D0 = No kraal manure.
D1 = Kraal manure in quantity to give 25 lb. P_2O_5 per acre.
D2 = Kraal manure in quantity to give 50 lb. P_2O_5 per acre.
P0 = No phosphate fertilizer.
P1 = 25 lb. P_2O_5 per acre as 1 : 1 mixture.
P2 = 50 lb. P_2O_5 per acre as 1 : 1 mixture.
L0 = No agricultural lime.
L1 = 3,000 lb. agricultural lime per acre.
L2 = 6,000 lb. agricultural lime per acre.

Soil Types - At Maseru: Residual grey-brown solonetzic sandy loam derived from sandstone, pH 5·2. *At Machache:* Residual lateritic red soil derived from basalt, pH 5·3.

Liming: In the winter of 1953 lime at the rates of 1000 lb. and 2000 lb. per acre was ploughed in on both sites (L1 and L2 respectively). The pH of the Foothill red loam was raised over one season from 5 to 5·5 by the L2 application, while on the grey-brown sandy loam at Maseru it was increased from 5·2 to 5·8.

During the 1954 winter the lime plots were given a second dressing, lime at the rate of 2000 lb. per acre added to L1 plots and at the rate of 4000 lb. per acre to L2 plots. For the results presented here, therefore, L1 = 3000 lb. lime per acre and L2 = 6000 lb. lime per acre.

Results: See Tables 7(a) and (b).

TABLE 7

Maize Grain in 200 lb. bags per acre

(a) Acid grey brown sandy loam, pH 5·2 (Ex. M. DPL.)

		P *applied as fertilizer*			L *Lime*			*Mean*
		P0	P1	P2	L0	L1	L2	
P *applied as manure* (D)	D0	7·86	8·31	9·66	7·11	9·44	9·29	8·61
	D1	10·07	11·36	10·35	9·30	10·98	11·50	10·59
	D2	12·03	11·36	12·37	10·47	12·47	12·83	11·92
Mean		9·99	10·34	10·79	8·96	10·96	11·20	

P *as fertilizer*	L *Lime*		
	L0	L1	L2
P0	7·97	10·61	11·40
P1	8·99	11·30	10·75
P2	9·93	10·98	11·47

Standard errors of means = ± 0·48
Standard errors of cell figures = ± 0·79

(b) Lateritic Red Soil pH 5·3 (8.M.DPL)

		P *applied as fertilizer*			L *Lime*			*Mean*
		P0	P1	P2	L0	L1	L2	
	D0	3·51	6·27	8·22	4·26	6·36	7·38	6·00
P *applied as manure* (D)	D1	5·22	7·95	9·06	5·51	7·94	8·78	7·41
	D2	6·31	8·57	10·06	6·22	9·38	9·34	8·31
	Mean	5·01	7·60	9·11	5·33	7·89	8·49	

P *as fertilizer*	L *Lime*		
	L0	L1	L2
P0	2·36	5·88	6·81
P1	5·53	8·08	9·18
P2	8·11	9·72	9·51

Standard error means = ± 0·25
Standard error cell figures = ± 0·44

Discussion: (M.DPL. experiments.) Although identical amounts of manure were applied to the two sites the response to manure in the absence of the fertilizer is more than that to phosphate in the absence of manure in the Lowland experiment, but is less, by approximately the same amount, in the heavier Foothill red loam. The P2 dressing of manure amounted to nearly 10 tons per acre (9196 lb.) of a sample containing 0·20 per cent P, applied with a 41 per cent moisture content.

The responses to lime at Machache follow the pattern of those for 1954 but are larger, as was anticipated when lime rates were trebled as a result of the pH changes recorded during that season. The response, in the absence of phosphate, of 4·45 bags per acre is worthy of note.

In 1954, at Maseru, the heavier dressing of lime (then 2000 lb. per acre) not only produced no response but induced a severe deficiency of iron. This year, however, the L2 treatment (now 6000 lb. per acre) increased yields significantly and caused no apparent deficiency.

No two factor interactions are significant.

(b) *M.L. Series:* Two simple trials with various rates of liming on maize were repeated at Teyateyaneng and Matsieng. As with the previous pair two different soil types were used, in this case the two main types found in the Lowlands.

Arrangement: At Matsieng; 5×5 Latin Square. At Teyateyaneng; 4 randomised blocks of 5 plots each.

Treatments: Rate of Agricultural Lime where :

L0 = No Agricultural Lime
L1 = 1,000 lb. lime per acre
L2 = 2,000 lb. lime per acre
L3 = 3,000 lb. lime per acre
L4 = 4,000 lb. lime per acre
} Applied in 1953

Basal: Superphosphate at 200 lb. per acre, drilled below seed.

Soil Types: At Teyateyaneng; Residual podsolic grey-brown sandy loam, pH 5·1. At Matsieng; Red doleritic sandy loam, pH 5·2.

Results: See Tables 8 and 9.

TABLE 8 (2. M. L.)
Maize grain in 200 lb. bags per acre
(a) Acid grey-brown sandy loam

	1954 Results	*1955 Results*
Treatment	*Mean Yield*	*Mean Yield*
L0	11·09	5·76
L1	12·20	6·52
L2	12·05	6·46
L3	10·58	6·92
L4	10·09	5·83
Mean	11·20	6·30
S.E.M. Ylds.	±0·69	±0·43
L.S.D. (5 %)	–	–
Variance ratio	1·76	1·34
F. requirement	3·26	3·26

TABLE 9 (3. M. L.)
Maize grain in 200 lb. bags per acre
(b) Acid red ferruginous sandy loam

	1954 Results	*1955 Results*
Treatment	*Mean yield*	*Mean yield*
L0	9·55	7·45
L1	11·42	7·37
L2	12·06	7·76
L3	12·72	8·29
L4	12·90	8·26
Mean	11·73	7·83
S.E.M. ylds	±0·42	±0·47
L.S.D. (5%)	1·21	–
Variance ratio	11·91	0·09
F. requirement	3·26	3·26

Discussion: At neither centre did liming in 1953 increase maize yields in 1955. The results obtained in 1954, the direct results, are tabulated as a matter of interest. The non appearance this year of the large response to lime obtained on the doleritic red sandy loam in 1954 is not easily accounted for.

(iii) *Residual Effects*

One of the main shortcomings of the N.P.K. and D.P.L. series is the lack of provision for measuring residual effects. Also no rotation of crops

features in these experiments. A long term rotation experiment was started in 1953 to provide information on the question. Directly manured maize is followed by a bean crop to measure the first year residual effects ; the beans in turn by wheat for the second year residual effects. In the wheat comparison is also made with direct phosphate. First year residual effect of phosphate is therefore also measured on the subsequent final unmanured maize phase, where it is compared with third year residual N.P.K. and D.

Arrangement: 2^5 two replicate factorial design in 8 blocks of 8 plots each, repeated on three sites, each site in any one year carrying one phase of a four course rotation of maize, beans, wheat, maize.

Treatments: (Maize [treated] phases only.) Factorial combinations of the presence and absence of N, P, K, D, and P' where :

N = 20 lb. N per acre as Sulphate of Ammonia.
P = 50 lb. P_2O_5 per acre as 1 : 1 Mixture.
K = 30 lb. K_2O per acre as Muriate of Potash.
D = 50 lb. P_2O_5 per acre applied as kraal manure.
P' = 50 lb. P_2O_5 per acre applied as fertilizer two years previously to wheat.

Soil Type: Grey-brown sandy loam.

Results: Until the first cropping cycle has been concluded results will be incomplete. Below are the yield figures for the second directly manured maize phase. P' in this case is the same as the no treatment control. See Table 10.

The first bean phase, measuring the residual effects of treatments applied to a previous maize crop was a failure. The crop was drowned in the floods in February. See Table 10.

TABLE 10 (Ex. Rot. 1)

Maize grain in 200 lb. bags per acre

Treatment	Mean Response	Response with							
		Nitrogen (N)		Phosphate (P)		Potash (K)		Manure (D)	
		Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.
N	1·11			0·98	1·25	1·63	0·60	1·10	1·12
P	2·33	2·19	2·46	–	–	2·81	1·84	2·18	2·48
K	0·21	0·73	0·30	0·70	0·27	–	–	0·22	0·21
D	0·94	0·93	0·95	0·79	1·09	0·94	0·93	–	–
SE±	1·05	1·06							

Mean yield 9·91 Variance ratio 2·05 F. requirements 1·92

(iv) *Manure and Fertilizer on Maize in the Mountains (10. M.DF)*

A small trial on maize was repeated at Mokhotlong to compare the effects of manure and fertilizer. It was the only Mountain experiment including manure as a treatment.

Arrangement: Randomised blocks ; 4 replications.

Soil Type: Colluvial – alluvial black clay.

Treatments: O, D, and DF where :

O = No treatment
D = 50 lb. P_2O_5 per acre as manure.
F = Complete fertilizer (40 lb. N, 50 lb. P_2O_5 and 30 lb. K_2O per acre).
DF Manure and complete fertilizer.

Results: See Table 11.

TABLE 11 (10. M.DF.)
Maize grain in 200 lb. bags per acre

Treatment	Mean yield
O.	7·51
F	7·72
D	7·51
DF	6·88
Mean	6·99
S.E.M. yields.	±1·30
L.S.D. (5%)	–
Variance ratio . . .	0·84

Discussion: There are no differences between treatments. The "Mountain Black Clays" are very fertile, climatic factors alone depressing yields.

(v) *Two Fertility Trials on Wheat (Ex. W.DF. 1 and Ex. W.DF.2)*

Two wheat experiments were laid down at Maseru in 1953 largely as an initial trial of field techniques, and before the rotation experiment, discussed above, had been started. The figures presented are the first year residual results.

Arrangement: Ex. W.DF. (1); 2^5 factorial design in 4 blocks of 8 plots each. Ex . W.DF. (2); 4×4 Latin Square.

Treatments: Ex. W.DF. (1). (Applied in March 1953.) Combinations of the presence and absence of N.P.K. and D with rates as in Ex. Rot. (1) Ex. W.DF. (2); O, D, F and DF where :

O = No treatment.
D = 50 lb. P·0· per acre as manure.
F = Complete fertilizer (20 lb. N, 50 lb. P_2O_5 30 lb. K_2O).
DF = Manure and complete fertilizer.

Soil Type: Grey-brown sandy loam.
Results: See Tables 12 and 13.

TABLE 12 (EX. W.DF. 1)
Wheat grain in 200 lb. bags per acre

Treatment	Mean Response	Response with							
		D		N		P		K	
		Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.
D	+0·66	–	–	+0·72	+0·59	+0·21	+1·10	+0·72	+0·56
N		+0.06	– ·07	–	–	– 0·27	+0·26	+0·04	—0·05
P	+0·802	+0·42	+1·31	+0·60	+1·13	,,–	–	+0·89	+0·84
K	—0·34	—0·30	—0·44	—0·33	—0·41	—0·35	—0·39	–	–
S. E.	±0·463	±0·327							

Mean yield 3·42 Variance ratio 2·97 F. requirement 2·60

TABLE 13 (EX. W.DF. 2.)

Wheat grain in 200 lb. bags per acre

Treatment	Mean yield
O	1·39
D	2·19
F	1·81
DF	2·49
Mean	1·97
S.E.M. ylds ±	0.063
L.S.D. (5%)	0·22
Variance ratio	57·47
F. requirement	4·76

Discussion: In the first experiment the residual effects of manure and phosphate are significant but none of the interactions. In the second the residual responses to manure and complete fertilizers are significant. It is of interest to note that the residual response to manure is slightly larger than the first year response.

(vi) *Phosphate on Maize (Ex. M.P. 1)*

On the Experiment Station at Maseru the trial with various forms and rates of phosphatic fertilizer on maize was continued on a typical grey-brown sandy loam.

Arrangement: Randomised blocks with 7 blocks of 10 plots each.

Treatments: Forms and rates of phosphatic fertilizers where :

O = No fertilizer.
S1 = 100 lb. superphosphate per acre.
S2 = 200 lb. superphosphate per acre.
SR1 = 100 lb. 1 : 1 mixture per acre.
SR2 = 200 lb. 1 : 1 mixture per acre.
R1 = 100 lb. raw Moroccan rock per acre.
R2 = 200 lb. raw Moroccan rock per acre.
L1 = 300 lb. Langfos per acre.
L2 = 600 lb. Langfos per acre.

Basal: None.

Results: See Table 14.

(TABLE 14 Ex. M.P1)

Maize grain in 200 lb. bags per acre

Treatment	1954	1955
	Mean yield	Mean yield
O	2·14	3·99
S1	5·70	6·08
S2	5·81	6·78
SR1	4·82	6·30
SR2	5·69	6·40
R1	4·31	7·09
R2	5·34	6·90
L1	3·78	6·20
L2	3·93	6·59
Mean	4·61	6·26
S.E.M. ylds	±0·50	±0·3602
L.S.D. (5%)	1·44	1·02
Variance ratio	5·9	6·422
F. requirement	2·14	2·14

Discussion: All phosphate applications significantly increased yields. The improved performance of the rock phosphates in the second year is of interest. Differences between forms and rates of phosphate are not significant.

(vii) *Minor Element Trials*

Trials with minor elements were carried out on wheat at Maseru and Mokhotlong (Mountains) and on maize at Maseru. The wheat trial at Maseru which embodied the spray versus broadcast dry contrast failed. At Mokhotlong the five salts were applied dry to the soil.

(a) *Mokhotlong* (Wheat).
Arrangement: 5 randomised blocks of 6 plots each.
Treatments: Dry soil applications of various salts, where :

O = No treatment.
Cu = 10 lb. copper sulphate per acre.
Zn = 5 lb. zinc sulphate per acre.
Mg = 50 lb. magnesium sulphate per acre.
Mn = 15 lb. manganese sulphate per acre.
B = 5 lb. borax per acre.

Basal: 200 lb. superphosphate per acre.
Soil Type: "Mountain black clay".
Results: See Table 15.

TABLE 15 (10 W. Min.)

Wheat grain in 200 lb. bags per acre

Treatment	*Mean yield*
O	2·12
Cu	2.25
Zn	2·02
Mg	1·91
Mn	1·70
B	1·77
Mean	1·96
S.E.M. ylds±	0·48
L.S.D (5%)	–
Variance ratio	1·90
F. requirement	2·71

Discussion: Yields are low and differences not significant.

(b) *Maseru* (Maize).

Five sulphate salts were sprayed on maize as 1 per cent solutions on three occasions during the season, – at 4 weeks, 8 weeks and 12 weeks after planting. The dressings amounted to 8·78 lb. of salt per acre.
Arrangement: Six randomised blocks of 7 plots each.
Treatments: Spray applications of minor elements as sulphate salts.
Basal: 200 lb. superphosphate per acre.
Soil Type: Grey-brown sandy loam.
Results: See Table 16.

TABLE 16 (Ex. M.Min.)

Maize grain in 200 lb. bags per acre

Treatment	Mean yields
O.	5·77
Cu	5·52
Zn	6·04
Mg	5·88
Mn	6·06
B	6·08
Mean	5·89
S.E. Mean yields ±	0.41
L.S.D. (5%)	–
Variance ratio	0·29
F. requirement	2·60

Discussion: There are no significant differences.

(viii) *Potash on Wheat (10. W.K.)*

A trial designed to test a hypothesis that the mountain black soils derived entirely from basalt will prove deficient in potash was repeated at Mokhotlong.

Arrangement: 5×5 Latin square.

Treatments: Rates of muriate of potash, where :

0 = No muriate of potash.
K1 = 10 lb. K_2O per acre as muriate of potash.
K2 = 20 lb. K_2O per acre as muriate of potash.
K3 = 30 lb. K_2O per acre as muriate of potash.
K4 = 40 lb. K_2O per acre as muriate of potash.

Basal: 200 lb. superphosphate per acre.

Results: See Table 17.

TABLE 17 (10 W.K.)

Wheat grain in 200 lb. bags per acre

Treatment	Mean yield
O.	3·56
KI.	2·84
K2	3·16
K3	2·67
K4	3·11
Mean	3·07
S.E.M. ylds ±	0·28
L.S.D. (5%)	–
Variance ratio	1·48
F. requirement	3·26

Discussion: Yield differences are not significant.

(ix) *Nitrogen on Maize (Ex. M.N.)*

The study of the relationship between plant stand density, rate of application of nitrogen fertilizer and time of application was continued

at Maseru. Few responses to nitrogen applications on maize, at the normal plant espacements used, have been recorded on rain grown maize in southern Africa.

Arrangement: 4 randomised blocks of 4 whole plots, 12 sub-plots and 36 sub-sub plots each.

Treatments: Plant espacements, rates of sulphate of ammonia and times of fertilizer application, where :

S1 = Plants 6″ apart in 3′ rows.
S2 = plants 12″ apart in 3′ rows.
S3 = Plants 18″ apart in 3′ rows.
S4 = Plants 24″ apart in 3′ rows.
N1 = 20 lb. N per acres as sulphate of ammonia.
N2 = 40 lb. N per acre as sulphate of ammonia.
N3 = 60 lb. N per acre as sulphate of ammonia.
T1 = Half at planting, half at first flowering.
T2 = All at 6 weeks after planting.
T3 = Half at 6 weeks, half at first flowering.
(Sulphate of ammonia placed in band 3″ from plants on uphill side for all times of application.)

Basal: 200 lb. superphosphate per acre.
Variety: American White Flint.
Plot sizes – Gross : 108′×36′ : 36′×36′ and 12′×36′. *Nett:* 66′×34′ (S1), 6′×32′ (S2), 6′×33′ (S3), 6′×32′ (S4).
Soil type: Red sandy loam on dolerite.
Results: See Table 18.

TABLE 18 (Ex. M. N.)

Maize grain in 200 lb. bags per acre

	N1	N2	N3	Mean
S1	5·49	8·45	11·90	8·61
S2	8·46	10·26	13·10	10·61
S3	9·24	11·41	13·47	11·37
S4	9·14	9·54	11·07	9·91
Mean	8·09	9·92	12·39	10·13

S. E. diff. two Nitrogen means = 0·393
S. E. diff. two spacing means = 1·274
S. E. diff. two rates nitrogen within one spacing = 0·787.
S. E. diff. two spacings within one rake N = 1·216

	T1	T2	T3
S1	8.25	9·52	8·70
S2	10·32	11·02	10·49
S3	11·13	11·26	11·72
S4	9·49	10·11	10·15

S. E. diff. two spacings within one time = 1·513.

	T1	T2	T3
N1	7·80	8·45	7·99
N2	9·39	10·38	9·96
N3	12·19	12·60	12·37
Mean	9·80	10·48	10·11

S. E. diff. two rates nitrogen within one time = 0·787.
S. E. diff. two times means = 0·50.

Discussion: No yield differences due to time of application are significant and the time of application of the sulphate ammonia did not effect the responses to the fertilizer. The response to sulphate of ammonia is large and significant as are the differences in response to the various rates of application. Due to the magnitude of the whole plot error the large mean yield differences due to spacing are not statistically significant. The general spacing by nitrogen interaction is significant, and includes significant lineas × lineas, cubic × quadratic and cubic × lineas components.

(x) *Weed Control in Maize* (*Ex. M.Wk*)

A modified experiment on methods of weed control in maize was continued at Maseru.

Arrangement: 6 randomised blocks of 9 plots each.

Treatments: Methods of weed control, where :

0 = No weed control.
Postspray = Post-emergent spray of 2·4D at 1 pt. per acre.
Prespray = Pre-emergent spray of 2·4D at 2 pts. per acre.
Postspray + 1C = Postspray as above plus one implement cultivation.
Prespray + 1C = Prespray as above plus one implement cultivation.
2C = Two implement cultivations.
3C = Three implement cultivations.
HC = Clean hand cultivation.
HC + 1C = One hand cultivation plus one implement cultivation.
(Prespray 5 days after planting; postspray when maize 4″ to 6″ tall. 2 pints amine salt contain 1lb. acid aquivalent.)

Basal: 200 lb. superphosphate per acre.

Recults: See Table 19.

TABLE 19

Treatment	*Mean yield*
HC + 1C	7·27
HC	7·25
3C	6·05
2C	5·82
Postpray + 1C	5·69
Prespray + 1C	3·66
Prespray	2·98
Postspray	2·31
O	1·37
Mean	4·71
S.E.M. ylds ±	0·49
L.S.D. (5%)	1·40
Variance ratio	19·40
F. requirement	2·18

Discussion: The superiority of hand cultivation is well demonstrated. Hand cultivation in Basutoland, where the average size of arable holding per family is 5·7 acres usually is not impracticable.

(xi) *Potatoes*

The experiment on the manuring and espacement of potatoes was lost through drowning.

(xii) *Winter Land Use*

A new trial designed to measure and compare the effects of various methods of winter use of arable lands is in progress. The winter communal grazing of lands in Basutoland with heavy grazing intensities followed by the romoval of all dung for domestic fuel and usually of all remnant maize stalks and weeds as well must have an important bearing on soil fertility. The 1955–56 crop will measure the first set of treatments applied last winter.

(3) Crop Studies

Details of aims of the work on crop varieties and the techniques used were given in the report on the Scheme for 1953–54.

(i) *Mountains and Foothills*

(a) *Maize:* The selection programme on maize was discontinued due to pressure of other work. All material has been retained in case it becomes possible to continue the programme at a later date.

(b) *Wheat:* 81 local lines of summer wheat were again compared in a microplot experiment at Machache, while the eight best selections so far made were planted in an ordinary large plot size variety trial there.

(c) *Sorghum:* The 120 sorghum selections retained from the previous year were planted out at Machache and at the end of the season 30 lines retained for further trial.

(ii) *Lowlands*

(a) *Maize:*

(1) The annual trail of 25 varieties was repeated at Maseru.

Arrangement: Triple lattice with 15 blocks of 5 plots each.

Treatments: 25 maize varieties.

Spacing: Plants 2′ apart in 3′ rows.

Plot size – Gross: 76′×12′ *Nett:* 72′×6′.

Basal: 200 lb. 1 : 1 mixture per acre, drilled below the seed.

Soil Type: Grey-brown sandy loam.

Cultivation: Two hand and two tractor cultivations.

Insecticides: Crop twice dusted with DDT.

Planted: 15/11/54.

Harvested: 4/7/55.

Results: See Table 20.

TABLE 20 (Ex. M.V.I)

Maize grain in 200 lb. bags per acre

(12·5% moisture)

Variety	Mean yield
1. K.64 x P.P. topcross	8·89
2. S.A. 200 double hybrid	7·97
3. Potchefstroom Pearl	7·84
4. Topbrid	7·70
5. K.64 x A.W.F. topcross	7·66
6. Golden Beauty	7·34
7. Teko Yellow	6·62
8. Kalahari Early Pearl	6·46
9. Natal 8–row	6·46
10. Anveld	6·28
11. American White Flint	6·25
12. Early King	6·08
13. Silver King	5·72
14. Early Pearl	5·54
15. Mic's Success	5·42
16. Eksteen	5·41
17. Synthetic Potchefstroom Pearl	5·38
18. Synthetic Anveld	5·23
19. Yellow Bushman	5·21
20. Iowa Silvermine	5·16
21. White Bushman	4·96
22. New England	4·80
23. Peruvian	4·50
24. Cincinatti Bushman	4·03
25. Kroonstad Robyn	3·57
Mean	6·02
S.E. Mean yld	±0·87
L.S.D. 5%	1·77

Discussion: The comparative performance of the hybrids is of interest. A trial such as this embodying but one (early) planting date and a single espacement (2′ apart in 3′ rows) will inevitably show either the small plant quick maturing group of varieties or the large plant slow maturing varieties to advantage, depending on the seasonal conditions, and is likely, as has happened here, to favour the latter. An attempt will be made next year to carry out trials at two planting dates.

(2) 49 South African yellow flint entries were again compared in a trial carried out for the maize breeder at the Bethlehem Research Station. The results are not tabulated.

(b) *Sorghum:* (Ex. S.V.) The sorghum variety trial failed.

(c) *Wheat:* (Ex. W.V. 1 and Ex. W.V. 2.)

25 varieties of winter wheat were compared at Maseru, for two planting dates, viz. mid April and early June.

Arrangement: 5×5 lattice with 4 replications.

Sowing rate: 40 lb. seed per acre broadcast and harrowed in.

Plot size – Gross: 15′×30′ 1. *Nett:* 13′×28′.

Basal: 200 lb. 1 : 1 phosphate mixture per acre.

Soil Type: Grey-brown sandy loam.
Planted: Early planting 23/4/54. Late planting 4/6/54.
Harvested: Early planting 11/12/54. Late planting 27/12/54.
Results: See Table 21.

TABLE 21

Wheat grain in 200 lb. bags per acre

Early planting		*Late planting*	
Variety	*Mean yields*	*Variety*	*Mean yields*
1. White Spitzkop	3·84	White Spitzkop	2·47
2. Punjab	3·79	Red Egyptian	2·45
3. Red Spitzkop	3·72	Maluti	2·41
4. Goudveld	3·37	Red Victory	2·29
5. Scheepers	3·32	Red Spitzkop	2·25
6. Penkop	3·26	Mountain No. 1	2·16
7. Red Egyptian	3·20	Talberg	2·10
8. Roussouw's Baard	3·18	Punjab	2·07
9. Maluti	3·17	Lalkasarwali	1·94
10. Lowland No. 1	3·0	Lowland No. 1	1·90
11. Daeraad	2·94	Impala	1·83
12. Sterling	2·91	Daeraad	1·83
13. Sonop	2·89	Vorentoe	1·82
14. Hoopvol	2·89	Goudveld	1·82
15. Impala	2·86	Scheepers	1·82
16. Harpers	2·82	Roussouw's Baard	1·81
17. Queen Fan	2·65	Sterling	1·78
18. Vorentoe	2·59	Harpers	1·76
19. Lalkasarwali	2·43	Sonop	1·74
20. "Manitoba"	2·40	Duiker	1·72
21. Mountain No. 2	2·36	Penkop	1·61
22. Talberg	2·34	Hoopvol	1·56
23. Duiker	2·09	Mountain No. 2	1·55
24. Mountain No. 1	1·98	Queen Fan	1·52
25. Red Victory	1·78	"Manitoba"	1·42
Mean	2·87		1·90
S.E. Mean yields ±	0·25		0·27
L.S.D. (5%)	0·50		0·54

Discussion: Few conclusions on the merits of varieties can be drawn after a single season's trial. The performances of the two Spitzkop varieties, recently bred in the Union for production in Highveld winter wheat areas are of interest.

(d) *Beans:* The bean variety trial (16 entries) was a failure through drowning.

(e) *Linseed:* (Ex. L.V.) Linseed was thought to have possibilities as a winter cash crop, maturing in time to be followed by summer maize. It is evident, however, that it is liable to frost and drought damage in the spring unless planted very late on fallowed land. Winter bare fallowing in Basutoland is difficult in the absence of suitable implements, and in any case possibly not to be encouraged because of the erosion danger. The trial on winter linseed will be discontinued.

Arrangement: 3×3 balanced lattice.
Treatments: 9 varieties of linseed.
Results: Differences in yield between varieties were not significant.

(f) *Castor:* (Ex. C.E.) The small exploratory experiment on castor, a new crop to Basutoland, was continued at Maseru.
Arrangement: 2^5 factorial design in 4 blocks of 8 plots each.
Treatments: Combinations of espacements and fertilizers, where :

S1 = Plants spaced 18″ apart in 3 ft rows.
S2 = Plants spaced 3 apart in 3 ft rows.
N = 20 lb. N per acre as Sulphate of Ammonia.
P = 50 lb. P_2O_5 per acre as 1 : 1 mixture.
K = 30 lb. K_2O per acre as Muriate of Potash.
L = 2,000 lb. Agricultural Lime per acre (1953).

Method of Application: Nitrogen side dressed at planting and 8 weeks. Phosphate and Potash drilled below seed. The lime was ploughed in in 1953.
Plot Size – Gross: 60′×15′. *Nett:* S1, 57′×9′ ; S2, 54′×9′.
Soil Type: Grey-brown sandy loam.
Cultivation: Two hand and two tractor cultivations.
Planted: 14/11/54.
Harvested: 20/5/55.
Results: See Table 22.

TABLE 22 (Ex. C)

Castor bean grain in 200 lb. bags per acre

Response to	Mean Response	Response with									
		N		P		K		L		S	
		Pres.	Abs	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	36″	18″
N	+0·33	–	–	+0·43	+0·22	+0·44	+0·11	+0·53	+0·13	+0·24	+0·41
P	+0·76	+0·87	+0·65	–	–	+0·86	+0·65	+0·67	+0·85	+0·66	+0·85
K	+0·22	+0·34	+0·10	+0·33	+0·11	–	–	+0·34	+0·10	+0·16	+0·28
L	+0·55	+0·75	+0·35	+0·46	+0·64	+0·67	+0·42	–	–	+0·28	+0·82
S	–0·37	–0·45	–0·28	–0·36	–0·27	–0·43	–0·30	–0·64	–022	–	–
36″—18″ S.E.	±0·16	±0·22									

Mean Yield = 2·44 Variance ratio = 3·99
F. requirement = 2·55

Discussion: The responses to phosphate and lime are significant.

(g) *Observation Plots:* Non replicated observation plots on a large range of varieties of sunflower, soybean, cowpea, bean, sorghum and potato were planted at Maseru. Yields are not presented.

A two-wheeled cart, supplied through Pilot Project

Good stand of dryland wheat in Basutoland Foothills.

Stone silt barriers constructed by school children (Pilot Project).

One of the fish ponds below the Khohlong dam (Pilot Project).

(h) *Fruit:* Satisfactory growth of the small trial apple orchard in the Foothills is recorded. The trees in the Mountain trial were damaged by buck.

(4) Co-operative Experiments

(i) *Description*

Three years' work on the ten District Experiment Plots with the NPK series on maize, sorghum and wheat has, it is felt, qualitatively defined the major nutrient deficiencies in Basutoland and, by virtue of the simplicity of the soil map, has given a gross picture of their distribution. Further, with the qualification that agronomic conditions were at an optimum (best available seed, full stands, clean cultivation, etc.), a good measure of the degree of deficiency has been established. The more subtle facts on the fertility status of the soils will emerge as this series and the other experiments are continued. However, that most soils in the Lowlands and Foothills are extremely deficient in phosphate is apparent, as was anticipated in the light of the results of South African work over many years.

Data on the economics of fertilizing under ordinary Basuto peasant farming conditions are now required. To this end, in 1954, 18 selected Demonstrators from all the Lowland districts were trained in field experiment methods and subsequently each man carried out a small fertilizer trial in his area, co-operating with a local farmer. The farmer, after the fertilizer was applied, planted and cultivated his crop in his normal manner.

(ii) *The Experiments*

Design: 3 randomised blocks of 4 plots each.
Treatments: 4 rates of the 1 : 1 phosphate mixture, where :

P0 = no fertilizer.
P1 = 75 lb. mixture per acre.
P2 = 150 lb. mixture per acre.
P3 = 225 lb. mixture per acre.

Method of application: Fertilizer broadcast in spring and ploughed in.
Plot size – Gross: 60′×21′. *Nett:* 60′×15′.
Results: See Table 23.
Discussion: Significant differences between treatments are recorded at 8 centres. The territorial mean yields of 1·83, 3·25, 3·65 and 4·50 bags per acre for none, 75 lb., 150 lb. and 225 lb. of the 1 : 1 phosphate mixture per acre respectively are apparently still well within the seasonal response curve and diminution had not started to operate. The mean response to 150 lb. of fertilizer per acre, the dressing usually recommended to farmers, of 1·82 bags per acre represents a nett profit of 15/- per acre. (Maize at 28/- per bag and fertilizer at 18/- per 125 lb.) The profit from the 225 lb. application is £1. 0. 9*d.*

TABLE 23

CO-OPERATIVE EXPERIMENTS, 1954–55

Maize grain in 200 lb. bags per acre

District	Butha Buthe		Leribe		Berea		Pilot Project		Maseru		Mafeteng		Mohale's Hoek		Quthing		Territorial Means
Area	Ligalaneng	Qholaqhoe	Pitseng	Hlotse	Phoofolo's	Mapoteng	Tebetebeng	Malimong	Roma	Marija	Mapotu	Mathebe	Mekaling	Tsoloane	Mt. Moorosi	Qomoqomong	13 Centres
Expt. No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Treatment																	
P0.	3·23	3·70	0·03	1·28	2·29	–	–	1·08	1·31	3.89	0·53	0·81	3·09	1·28	–	1·21	1·83
P1.	4·91	7·86	0·23	4·30	4·57	–	–	2·96	2·45	4·60	1·07	1·08	4·03	1·14	–	3·09	3·25
P2.	4·94	9·41	0·40	5·37	3·63	–	–	3·22	3·24	2·89	0·94	2·02	5·92	1·21	–	4·30	3·65
P3.	4·30	11·23	0·22	6·18	6·32	–	–	5·51	3·36	3·92	0·80	2·96	6·05	1·75	–	5·92	4·50
Mean	4·34	8·05	0·22	4·29	4·20	–	–	3·77	2·59	3·83	0·84	1·71	4·77	1·35	–	3·63	3·31
S.E. MYlds ±	0·76	0·57	0·17	0·82	0·60	–	–	0·90	0·36	0·54	0·38	0·18	0·38	0·12	–	1·17	
L.S.D. (5%)	–	1·97	–	2·84	2·06	–	–	2·20	1·26	–	–	0·61	1·32	0·40	–	–	
		*	*		*			*	*			*	*	*			
Var. Ratio	1·11	31·70	2·68	6·88	8·08	–	–	8·19	6·78	1·41	0·36	30·51	14·60	5·71	–	2·90	
F. reqmt.	4·76																

Experiments 6 and 15 drowned : experiment 7 destroyed by stock.
* Significant at level P = 0·05.

In studying these results the following points are to be borne in mind:

(a) The fertilizers were applied broadcast. The first year response to broadcast applications is usually lower than that to drilled fertilizer.

(b) The seasonal conditions were extremely poor and most stands were caught by the early frost mentioned previously. This is reflected in the cob-grain ratio, where the 10,235 cobs recorded yielded 1277·2 lb. of grain; an average of 2 ozs. grain per cob.

(c) The standard block shape used was inefficient because of the terracing effect of the contour banks which traverse most lands in the Territory.

The mean yield of unfertilized plots on 13 widely distributed sites of 1·83 bags per acre must give a good estimate of the average yield in the Lowlands and Foothills during the season.

PRESENT SEASON TRIALS (1955–56)

The programme reported on here is being continued with certain additions. 32 new small experiments on rates of phosphate fertilizing on maize are being carried out in co-operation with landowners on typical Basuto fields, while on the main station five new projects have been started, viz. investigations into (a) winter land use of arable lands, (b) the comparative merits and long term effects of phosphate fertilizer, kraal manure and manure ash, (c) the possibilities of growing wheat in summer, (d) the interplanting of various crops on the same land and, (e) the performance of certain maize varieties when planted late in the season.

LIAISON WITH OTHER WORKERS AND ACKNOWLEDGMENTS

When in the United Kingdom on leave the Soil Fertility Worker visited Rothamsted Experiment Station and the Agricultural and Horticultural Research Station, Long Ashton. The advice of Mr. G. E. Hodnett on certain statistical matters is acknowledged, as is the assistance with provision of various seeds by officers of the Potchefstroom and Bethlehem stations in South Africa.

The excellent service rendered by the Junior Service assistants, without which the Scheme could not succeed, must be placed on record.

A. C. Venn,
Reporting Officer.

APPENDIX I

MEAN MONTHLY RAINFALL

(Nine stations, at District Headquarters)

			Average for 5 years	*Variation*
1954	September	·63 inches	·95	— ·32
	October	1·02 „	2·67	—1·65
	November	3·09 „	3·10	— ·01
	December	3·48 „	3·53	— ·05
1955	January	7·65 „	4·82	+2·83
	February	7·36 „	5·62	+1·74
	March	2·92 „	3·32	— ·40
	April	2·69 „	2·32	+ ·37
	May	1·38 „	·98	+ ·40
	June	·70 „	·47	+ ·23
	July	·19 „	·45	— ·26
	August	·22 „	·44	— ·22
	September	·14 „	·95	— ·81
	October	2·25 „	2·67	— ·42
	November	3·85 „	3·10	+ ·75
	December	5·45 „	3·53	+1·92
	Total	34·80 „	28·67	+6·13

Annual Average for 39 years – 28·84 inches.

APPENDIX II

In the list which follows are given dispositions of staff as at 31st December, 1955.

Maseru

P. A. Bowmaker, O.B.E.	Director of Livestock and Agricultural Services.
D. D. Campbell, M.C.	Principal Agricultural Officer.
P. H. Brown	Principal Veterinary Officer.
L. H. Collett, O.B.E.	Soil Conservation Officer.
G. R. Chalmers	Wool and Mohair Officer.
N. Ralitapole	Veterinary Officer.
A. C. Venn	Soil Fertility Officer.

J. R. L. Kotsokoane	Agricultural Education Officer.
A. G. Brightmore	Senior Agricultural and Livestock Officer.
V. S. Gilbey	Agricultural and Livestock Officer (Experiment Station).
S. H. Youthed	Development Officer (Seconded to Soil Conservation work).
S. J. Lekoatsa	Development Officer.
R. F. Phillips	Accounting Clerk.
N. W. Dixie	Assistant Accounting Clerk.
Miss H. B. Corney	Senior Lady Clerk.
F. Makhooane	Clerk-Storekeeper.
Mrs. C. E. Carton	Lady Clerk-Typist.
E. T. G. Ntšasa	Assistant Agricultural and Livestock Officer.
N. Molapo	Administrative Assistant.
T. Motsamai	Senior Veterinary Assistant.
E. T. Tau	Teacher-Boarding Master.
	1 Senior Conservation Foreman.
	2 Soil Conservation Foremen.
	10 Demonstrators.
	3 Veterinary Assistants.
	12 Assistant Demonstrators.
	8 Clerks.

Mafeteng

E. J. V. Wiggill	Agricultural and Livestock Officer.
	1 Soil Conservation Foreman.
	1 Veterinary Assistant.
	3 Demonstrators.
	4 Assistant Demonstrators.
	1 Clerk.

Mohale's Hoek

J. G. S. Bennie	Agricultural and Livestock Officer (seconded to Mauritius).
A. Bisschoff	Agricultural and Livestock Officer.
	1 Veterinary Assistant.
	5 Demonstrators.
	6 Assistant Demonstrators.
	1 Clerk.

Quthing

H. B. Wroughton	Agricultural and Livestock Officer.
C. M. K. Seape	Development Officer (Acting Agricultural and Livestock Officer).
	1 Veterinary Assistant.
	4 Demonstrators.
	6 Assistant Demonstrators.
	1 Clerk

Qacha's Nek

P. Millin	Agricultural and Livestock Officer.
G. Nchee	Development Officer.
	1 Veterinary Assistant.
	7 Demonstrators.
	4 Assistant Demonstrators.
	1 Clerk.

Mokhotlong

J. J. Axentowicz	Development Officer (Acting Agricultural and Livestock Officer).
	1 Veterinary Assistant.
	7 Demonstrators.
	5 Assistant Demonstrators.
	1 Clerk

Butha-Buthe, Leribe and Berea

I. L. Chard	Senior Agricultural and Livestock Officer

Butha-Buthe

A. Mathule	Assistant Agricultural and Livestock Officer (Acting Agricultural and Livestock Officer).
	1 Veterinary Assistant.
	3 Demonstrators.
	4 Assistant Demonstrators.
	1 Clerk.

Leribe

S. Letsie, B.E.M.	Development Officer (Acting Agricultural and Livestock Officer).
	2 Soil Conservation Foremen.
	1 Veterinary Assistant.
	6 Demonstrators.
	4 Assistant Demonstrators.
	1 Clerk.

Berea

D. Lekena, B.E.M.	Development Officer (Acting Agricultural and Livestock Officer).
	1 Veterinary Assistant.
	1 Soil Conservation Foreman.
	3 Demonstrators.
	4 Assistant Demonstrators.
	1 Clerk.

Pilot Project

A. J. A. Douglas, M.B.E.	Administrative Officer (seconded).
A. L. Mapham	Agricultural Officer (seconded).

P. J. Naude	Mechanic-Supervisor.
G. Mochochoko	Development Officer (seconded).
	1 Soil Conservation Foreman (seconded)
	1 Co-operative Organizer.
	4 Demonstrators (seconded).
	1 Clerk (seconded).
	1 Clerk-Recorder.

Mechanized Group Farming

A. H. Gibson	Agricultural and Livestock Officer (seconded).
P. Tšoeu	Assistant Agricultural and Livestock Officer (seconded).

Vacancies on Establishment

1 Agricultural Officer.
1 Senior Agricultural and Livestock Officer.
1 Forestry Officer.
1 Assistant Agricultural and Livestock Officer.
13 Assistant Demonstrators.

APPENDIX III

IMPORTATION OF MAIZE FROM THE UNION OF SOUTH AFRICA *(Bags of 200 lb. nett.)*

	1948–49	*1949–50*	*1950–51*	*1951–52*	*1952–53*	*1953–54*	*1954–55*	*1955–56*	*Total*	*Average*
May		16000	4559	4263	2027	3381	5083	16728	52041	7430
June		16000	1797	7179	525	1378	2204	7272	36355	5190
July		18000	803	7386	3159	1172	1834	8866	41220	5900
August		37726	244	14259	6210	6765	4405	15819	85428	12204
September		39307	159	14262	6239	644	2582	26250	89443	12778
October	22	60393	177	19395	9909	2002	6265	33340	131503	16438
November	31	52026	8102	38292	16801	1506	2514	40416	159688	19961
December	28	42177	10373	37236	15827	768	4703	36038	147150	18394
January	2056	25426	8957	41479	8960	1876	6220		94974	13570
February	2000	14539	5410	25499	6079	6691	5407		65625	9370
March	2000	10419	6969	16955	6281	7182	7641		57447	8290
April	3000	7328	8582	12509	2276	6418	15387		55500	7930
Total	9137	339341	56132	238714	84293	39783	64245	184729	1016374	137455

APPENDIX IV

ORDER
ISSUED BY THE PARAMOUNT CHIEF UNDER THE PROVISIONS OF SECTION 8(1) (r) OF THE NATIVE ADMINISTRATION PROCLAMATION, CAP. 54 OF THE LAWS OF BASUTOLAND

PREVENTION OF SOIL EROSION

PREAMBLE :

Whereas it is expedient to make further provision for the prevention of soil erosion in Basutoland ;

I now, therefore, order as follows :

ORDER :

The following order 5 (ter) is hereby added to the orders issued by the Paramount Chief and published as Part III of the Laws of Lerotholi :

"5(ter). *Prevention of Soil Erosion Caused by Over-grazing*

(1) Control of grazing in the cattlepost areas shall be the responsibility of the Principal or Ward Chief in whose ward the grazing is found. Provided that this responsibility may be delegated in writing by the Principal or Ward Chief to any other person normally living in his ward.

Sectional Survey

(2) On the advice of an officer of the Agricultural Department nominated for this purpose by the Director of Livestock and Agricultural Services, every Principal and Ward Chief shall ascertain the number of livestock to be grazed in each section of his cattle post country.

Note: For the purposes of this Order one head of large stock (cattle, equines) shall be considered as being equal to five head of small stock (sheep and goats). A section of cattle post country shall mean an area well defined by natural features and never greater than 12 square miles in extent.

Review of Carrying Capacity

(3) The carrying capacity of any section may be subject to review from time to time, at intervals of not less than three years.

Records

(4) A written record shall be kept by each Principal or Ward Chief of the sectional carrying capacity of his cattle post areas. From this it

follows that cattle post areas shall be defined, i.e. their lower limits where contiguous to village areas shall for each section be described for the purposes of the written record.

Permits

(5) No person shall use cattle post areas for grazing livestock without the written permisson renewable annually in October of the Principal or Ward Chief in whose area the cattle post is situated and on which is stated the number of livestock which that person may graze. Such authority must be kept at all times by the person in charge of the livestock.

Grazing open to all

(6) No Principal or Ward Chief shall refuse to grant written permission to any person to graze livestock at cattle posts within his ward : Provided that permission may be refused if the grant thereof would result in the carrying capacity of the ward being exceeded.

Rotational Grazing

(7) All cattle post sections shall be divided for rotational grazing purposes by the Principal or Ward Chief on the advice of the Agricultural and Livestock Officer of the District. Areas declared as "maboella" for the purposes of this paragraph shall be subject to customary "leboella" regulations as applied in village areas. Damages for trespass shall be paid to the Principal or Ward Chief's nominee in cases where control has been delegated as provided for in paragraph (1) of this Order.

Siting of cattle posts

(8) No person shall establish a cattle post at a site other than that indicated by the Principal or Ward Chief or his representative appointed for that purpose.

Note: Cattle post sites will normally be allowed on at valley bottoms, and not on mountain slopes."

Given under my hand at Matsieng this 18th day of November, 1955, and to be of effect from the same day.

(Sgd) 'M'ANTSEBO SEEISO,
Paramount Chief.

APPENDIX V

LIVESTOCK INDUSTRY STATISTICS

	Cattle	*Horses*	*Mules*	*Donkeys*	*Sheep*	*Goats*
Census (1955)	408,144	102,001	4,829	48,855	1,339,019	654,800
Exports	12,927	85	–	–	4,079	46
Imports	6,322	2,382	74	195	895	273
Wool Exports (lb.)	–	–	–	–	7,700,701	–
Mohair Exports (lb.)	–	–	–	–	–	1,103,000
Bones Exported (lb.)	820,600	–	–	–	–	–
Hides Exported (Units)	38,604	–	–	–	–	–
Skins Exported (Units)	–	–	–	–	122,471 Sheep & Goats)	